No. 17-1104

IN THE

Supreme Court of the United States

AIR AND LIQUID SYSTEMS CORP., CBS CORPORATION, AND FOSTER WHEELER LLC,

Petitioners,

v.

ROBERTA G. DEVRIES, Administratrix of the Estate of John B. DeVries, Deceased, and Widow in her own right,

Respondent.

INGERSOLL RAND COMPANY,

Petitioner,

v.

SHIRLEY MCAFEE, Executrix of the Estate of Kenneth McAfee, and Widow in her own right,

Respondent.

On Writ of Certiorari to the United States Court of Appeals for the Third Circuit

JOINT APPENDIX (VOLUME I OF II)

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PETITION FOR CERTIORARI FILED JANUARY 31, 2018
CERTIORARI GRANTED MAY 14, 2018

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(continued from front cover)

TABLE OF CONTENTS

Page

VOLUME I

Docket Entries,
In re: Asbestos Products Liability Litigation (No. VI), No. 16-2669 (3d Cir.) 1

Docket Entries,
In re: Asbestos Products Liability Litigation (No. VI), No. 16-2602 (3d Cir.) 3

Docket Entries,
In re: Asbestos Products Liability Litigation (No. VI), No. 15-2667 (3d Cir.) 5

Docket Entries,
In re: Asbestos Products Liability Litigation (No. VI), No. 15-1278 (3d Cir.) 7

Docket Entries,
McAfee, et al. v. 20th Century Glove Corp. of Texas, No. 5:13-cv-06856-GJP (E.D. Pa.) 10

Docket Entries,
DeVries, et al. v. General Electric Co,, et al., No. 5:13-cv-00474-ER (E.D. Pa.) 13

Materials from District Court Proceedings

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.)
(Doc. 269-1, pages 2–18) (excerpts of Exhibit A to Motion for Summary Judgment filed by CBS Corporation) 22

TABLE OF CONTENTS
(continued)

Page

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 269-2, pages 2–38) (excerpts of Exhibit B to Motion for Summary Judgment filed by CBS Corporation) 46

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 270-1, pages 2–53) (excerpts of Exhibit A to Motion for Summary Judgment filed by General Electric Company) 90

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 270-2, pages 2–19) (excerpts of Exhibit B to Motion for Summary Judgment filed by General Electric Company) 224

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 270-3, pages 7, 25, 33–34, 50–51, 56, 62) (excerpts of Exhibit C to Motion for Summary Judgment filed by General Electric Company) 259

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 273, pages 14–49) (Exhibits A-C to Motion for Summary Judgment filed by Imo Industries, Inc.) 266

TABLE OF CONTENTS
(continued)

Page

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 274, page 16) (excerpt of Exhibit A to Motion for Summary Judgment filed by Air & Liquid Systems Corporation) 361

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 277-4, pages 1–4) (excerpts of exhibits to Motion for Summary Judgment filed by Foster Wheeler LLC) 362

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 291, pages 13, 17, 19–22) (excerpts of Exhibit A to Answer to Motion for Summary Judgment of Foster Wheeler LLC) 369

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 291, pages 27–29) (excerpts of Exhibit B to Answer to Motion for Summary Judgment of Foster Wheeler LLC) 383

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 291, pages 33, 35) (excerpts of Exhibit C to Answer to Motion for Summary Judgment of Foster Wheeler LLC) 389

TABLE OF CONTENTS
(continued)

Page

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 291-1, pages 1–8) (excerpts of Exhibit C to Answer to Motion for Summary Judgment of Foster Wheeler LLC, continued) 391

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 294, pages 15–19) (excerpts to Exhibit A of Answer to Motion for Summary Judgment of General Electric Company) 398

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 294-3, pages 3–10) (excerpts to Exhibit G of Answer to Motion for Summary Judgment of General Electric Company) 410

VOLUME II

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296, pages 20–22) (excerpts to Exhibit A of Answer to Motion for Summary Judgment of CBS Corporation) 420

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296-1, pages 9–13) (Exhibit C of Answer to Motion for Summary Judgment of CBS Corporation) 427

TABLE OF CONTENTS
(continued)

Page

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296-2, pages 18–21) (excerpts of Exhibit F of Answer to Motion for Summary Judgment of CBS Corporation).....437

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296-2, pages 30–31, 34–36) (excerpts of Exhibit G of Answer to Motion for Summary Judgment of CBS Corporation, continued).....443

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296-2, page 45 — Doc. 296-3, pages 1–2) (excerpts of Exhibit H of Answer to Motion for Summary Judgment of CBS Corporation).....448

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (excerpts of Exhibit H of Answer to Motion for Summary Judgment of CBS Corporation, continued).....453

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296-3, pages 8–9) (Exhibit I to Answer to Motion for Summary Judgment of CBS Corporation).....459

TABLE OF CONTENTS
(continued)

Page

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 297, pages 16–22, 28–29) (excerpts of Exhibits B & C of Answer to Motion for Summary Judgment of IMO Industries, Inc.) 463

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 298, page 19) (excerpts of Exhibit A of Answer to Motion for Summary Judgment by Buffalo Pumps, Inc).....472

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 298-2, pages 7–8) (excerpts of Exhibit D of Answer to Motion for Summary Judgment by Buffalo Pumps, Inc.) 473

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 298-4, pages 6–10) (Exhibit J of Answer to Motion for Summary Judgment by Buffalo Pumps, Inc.).....480

McAffee v. 20th Century Glove Corp., No. 13-06856-ER (E.D. Pa.) (Doc. 171, pages 18–31; 33–43) (excerpts of Exhibits A & B of Ingersoll Rand Company's Motion for Summary Judgment) 486

TABLE OF CONTENTS
(continued)

Page

McAffee v. 20th Century Glove Corp., No. 13-06856-ER (E.D. Pa.) (Doc. 203, pages 16–19, 22–24, 30–31, 37–49) (excerpts of Exhibits A, B, & C of Answer to Motion for Summary Judgment of Ingersoll-Rand Company) 557

McAffee v. 20th Century Glove Corp., No. 13-06856-ER (E.D. Pa.) (Doc. 203-1, pages 1–2, 31–50) (excerpts of Exhibit D of Answer to Motion for Summary Judgment of Ingersoll-Rand Company) 593

McAffee v. 20th Century Glove Corp., No. 13-06856-ER (E.D. Pa.) (Doc. 203-2) (excerpts of Exhibit D of Answer to Motion for Summary Judgment of Ingersoll-Rand Company, continued) 642

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa., October 3, 2014) (order awarding summary judgment to Warren Pumps) 745

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa., October 3, 2014) (order awarding summary judgment to IMO Industries, Inc.) 757

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa., October 10, 2014) (order awarding summary judgment to General Electric Company) 770

TABLE OF CONTENTS
(continued)

Page

Materials from Third Circuit Proceedings

DeVries, et al. v General Electric Company, et al., No. 15-1278 (3rd Cir.) (Joint Appendix 729) 782

DeVries, et al. v General Electric Company, et al., No. 15-1278 (3rd Cir.) (Joint Appendix 1508-12) 784

DeVries, et al. v General Electric Company, et al., No. 15-1278 (3rd Cir.) (Joint Appendix 1540-42) 797

Addendum A to Brief of Defendant-Appellee General Electric Company, No. 16-2602 (3d Cir.) 803

GENERAL DOCKET

UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT

Court of Appeals Docket #: 16-2669

* * *

Appeal From: United States District Court for the Eastern District of Pennsylvania

* * *

In re: Asbestos Products Liability Litigation (No. VI)

Date Filed	Docket Text
06/06/2016	CIVIL CASE DOCKETED. Notice filed by Appellant Shirley McAfee in District Court No. 5-13-cv-06856 and 2-01-md-00875. (DW) [Entered: 06/06/2016 02:43 PM]
	* * *
06/23/2016	CLERK ORDER The joint motion to consolidate the appeals at Nos. 16-2602 & 16-2669 is granted. The actions are consolidated for all purposes, filed. [16-2602, 16-2669] (CJG) [Entered: 06/23/2016 11:34 AM]
	* * *
10/03/2017	PRECEDENTIAL OPINION Coram: VANASKIE, SHWARTZ and RESTREPO, Circuit Judges. Total Pages: 19. Judge: VANASKIE Authoring. [16-2602, 16-2669] (CJG) [Entered: 10/03/2017 09:24 AM]
10/03/2017	JUDGMENT, Affirmed In Part as to Appellants' strict liability claims.

With respect to Appellants' negligence claims, the cases are Remanded to the District Court. Costs shall not be taxed. [16-2602, 16-2669] (CJG) [Entered: 10/03/2017 09:25 AM]

* * *

GENERAL DOCKET

UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT

Court of Appeals Docket #: 16-2602

* * *

Appeal From: United States District Court for the Eastern District of Pennsylvania

* * *

In re: Asbestos Products Liability Litigation (No. VI)

Date Filed	Docket Text
5/31/2016	CIVIL CASE DOCKETED. Notice filed by Appellant Roberta G. Devries in District Court No. 5-13-cv-00474,2-01-md-00875. (CJG) [Entered: 05/31/2016 10:04 AM]
	* * *
06/23/2016	CLERK ORDER The joint motion to consolidate the appeals at Nos. 16-2602 & 16-2669 is granted. The actions are consolidated for all purposes, filed. [16-2602, 16-2669] (CJG) [Entered: 06/23/2016 11:34 AM]
	* * *
10/03/2017	PRECEDENTIAL OPINION Coram: VANASKIE, SHWARTZ and RESTREPO, Circuit Judges. Total Pages: 19. Judge: VANASKIE Authoring. [16-2602, 16-2669] (CJG) [Entered: 10/03/2017 09:24 AM]

10/03/2017	**JUDGMENT, Affirmed In Part as to Appellants' strict liability claims. With respect to Appellants' negligence claims, the cases are Remanded to the District Court. Costs shall not be taxed. [16-2602, 16-2669] (CJG) [Entered: 10/03/2017 09:25 AM]**

* * *

GENERAL DOCKET

UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT

Court of Appeals Docket #: 15-2667

* * *

Appeal From: United States District Court for the Eastern District of Pennsylvania

* * *

In re: Asbestos Products Liability Litigation (No. VI)

Date Filed	Docket Text
07/16/2015	CIVIL CASE DOCKETED. Notice filed by Appellants Kenneth McAfee and Shirley McAfee in District Court No. 5-13-cv-06856 & 2-01-md-00875. (OM) [Entered: 07/16/2015 05:12 PM]
	* * *
11/16/2015	ECF FILER: ELECTRONIC BRIEF with Appendix Volume I on behalf of Appellants Kenneth McAfee and Shirley McAfee, filed. Certificate of Service dated 11/16/2015 by ECF. -- [Edited 11/20/2015 by EAF - Text edited to indicate Appendix attached; Appendix Volume II removed and refied as of 11/20/15] (REP) [Entered: 11/16/2015 11:23 AM]
	* * *
11/20/2015	ECF FILER: ELECTRONIC APPENDIX VOLUME II on behalf of Appellants Kenneth McAfee and Shirley McAfee, filed. Certificate of service

	dated 11/20/2015 by ECF. --[Edited 11/20/2015 by EAF - Text edited to specify volume] (REP) [Entered: 11/20/2015 09:09 AM]
	* * *
05/12/2016	ORDER (VANASKIE, SHWARTZ and RESTREPO, Circuit Judges) Upon Consideration of the Arguments by Counsel Presented in their Briefs, It is Hereby Ordered that the Case is Summarily Remanded to the District Court to consider these items. In the event that a subsequent appeal is taken after the proceedings on remand have concluded, any future appeal will be considered by this panel after completion of briefing, filed. Judge: SHWARTZ Authoring, (See Order for Full Text). (PDB) [Entered: 05/12/2016 04:28 PM]
	* * *

GENERAL DOCKET

UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT

Court of Appeals Docket #: 15-1278

* * *

Appeal From: United States District Court for the Eastern District of Pennsylvania

* * *

In re: Asbestos Products Liability Litigation (No. VI)

Date Filed	Docket Text
2/12/2015	CIVIL CASE DOCKETED. Notice filed by Appellant Roberta G. Devries in District Court No. 5-13-cv-00474 and 2-01-md-00875. (ARR) [Entered: 02/12/2015 04:25 PM]
	* * *
06/09/2015	ECF FILER: ELECTRONIC BRIEF with Volume I of Appendix attached on behalf of Appellant Roberta G. Devries, filed. Certificate of Service dated 06/09/2015 by ECF. [Appendix Volumes II-VII were removed from this entry by the Clerk as they were re-filed separately]--[Edited 06/10/2015 by MS] (REP) [Entered: 06/09/2015 02:27 PM]
	* * *
06/09/2015	ECF FILER: ELECTRONIC APPENDIX on behalf of Appellant Roberta G. Devries, filed. Certificate of service dated 06/09/2015 by ECF. (REP) [Entered: 06/09/2015 04:02 PM]

* * *

08/10/2015	ECF FILER: JOINT SUPPLEMENTAL ELECTRONIC APPENDIX on behalf of Appellees Buffalo Pumps Inc, CBS Corp, Foster Wheeler LLC, GE Co, IMO Industries Inc and Warren Pumps, filed. Certificate of service dated 08/10/2015 by ECF.--[Edited 08/11/2015 by MCW] (PJS) [Entered: 08/10/2015 03:33 PM]
08/10/2015	ECF FILER: ELECTRONIC BRIEF on behalf of Appellee Foster Wheeler LLC, filed. Certificate of Service dated 08/10/2015 by ECF. (LJJ) [Entered: 08/10/2015 04:22 PM]

* * *

02/05/2016	ORDER (VANASKIE, SHWARTZ and RESTREPO, Circuit Judges), summarily remanding this case to the District Court to determine whether the District Court: (1) considered the negligence theory; (2) concluded that the bare metal defense applies to it and why, or (3) considered whether the circumstances listed in the case cited herein should apply to a negligence claim brought under maritime law (and if not, why not, and if so, why and whether the record here would support such a claim). In the event that a subsequent appeal is taken after

the proceedings on remand have concluded, any future appeal will be considered by this panel after completion of briefing, filed. Judge: SHWARTZ Authoring (ARR) [Entered: 02/05/2016 05:41 PM]

* * *

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF PENNSYLVANIA
(ALLENTOWN)
CIVIL DOCKET FOR CASE # 5:13-cv-06856-GJP

MCAFEE, et al. v.
20TH CENTURY GLOVE CORP. OF TEXAS

* * *

Date Filed	#	Docket Text
11/25/2013	1	NOTICE OF REMOVAL by CBS CORPORATION, GENERAL ELECTRIC COMPANY from Philadelphia Common Pleas, case number 131000205. Certificate of Service.(Filing fee $ 400 receipt number 092116)(jwl,) (Entered: 11/26/2013)
		* * *
08/25/2014	171	First MOTION for Summary Judgment filed by INGERSOLL-RAND & CO..memorandum, certificate of service.(RYAN, DANIEL) (Entered: 08/25/2014)
		* * *
09/24/2014	203	RESPONSE to Motion re 171 First MOTION for Summary Judgment *of Ingersoll-Rand* filed by KENNETH E. MCAFEE. (Attachments: # 1 Exhibit, # 2 Exhibit)(PAUL,

		ROBERT) (Entered: 09/24/2014)
		* * *
10/23/2014	218	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT INGER-SOLL-RAND & CO. (DOC. NO. 171) IS GRANTED. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/22/2014.10/27/2014 ENTERED AND COPIES E-MAILED.(jmg,) (Entered: 10/27/2014)
		* * *
07/08/2015	275	NOTICE OF APPEAL by KENNETH E. MCAFEE. Copies to Judge, Clerk USCA, Appeals Clerk and (PAUL, ROBERT) Modified on 7/10/2015 (fb). (Entered: 07/08/2015)
		* * *
05/26/2016	280	ORDER THAT THIS COURT REAFFIRMS IT 10/22/14 ENTRY OF JUDGMENT AND DIRECTS ANY INTERESTED PARTIES TO ITS REASONING SET FORTH IN ITS 5/19/16 EXPLANATORY ORDER. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 5/25/16. 5/26/16 ENTERED AND COPIES E-

		MAILED.(mbh,) (Entered: 05/27/2016)
05/31/2016	**281**	**NOTICE OF APPEAL by KENNETH E. MCAFEE. Fee Not Paid. Copies to Judge, Clerk USCA, Appeals Clerk.(PAUL, ROBERT) Modified on 5/31/2016 (fb). (Entered: 05/31/2016)**

* * *

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF PENNSYLVANIA
(ALLENTOWN)
CIVIL DOCKET FOR CASE #: 5:13-cv-00474-ER

DEVRIES, et al. v.
GENERAL ELECTRIC COMPANY et al.

* * *

Date Filed	#	Docket Text
01/25/2013	1	NOTICE OF REMOVAL by CBS CORPORATION, GENERAL ELECTRIC COMPANY from Philadelphia CCP, case number December 2012 No. 3661. (Filing fee $ 350 receipt number 075971), Certificate of Service.(tj,) (Additional attachment(s) added on 1/28/2013: # 1 Exhibits C-E) (tj,). (Entered: 01/28/2013)
		* * *
07/02/2013	168	AMENDED COMPLAINT with Certificate of Service against ALLEN-BRADLEY COMPANY, ALLEN-SHERMAN-HOFF, AMTICO, AURORA PUMP, AZROCK INDUSTRIES, INC., BELL & GOSSETT/DOMESTIC PUMP, BRYANT HEATING AND COOLING, BUFFALO PUMPS, INC., BURNHAM LLC, BW/IP, INC., CHICAGO

DRYER, CLEAVER BROOKS, INC., COPES VULCAN, CRANE CO., CROUSE-HINDS, DAL-TILE, DENISON INTERNATIONAL, DOVER CORPORATION, EDWARDS VALVE, ELLIOT GROUP U.S. HEADQUARTERS, FOSTER-WHEELER LLC, GARDNER-DENVER-JOY COMPRESSORS, GENERAL ELECTRIC COMPANY, GLASGOW, INC., GOODYEAR CANADA, GOODYEAR TIRE & RUBBER CO., GUARD LINE, INC., HAMPSHIRE INDUSTRIES, HARNISCHFEGER CORP., HENKLES AND MCCOY, INC., INSUL CORPORATION, J.A. SEXAUER, METROPOLITAN LIFE INS. CO., MINNESOTA MINING & MANUFACTURING, OWENS-ILLINOIS, INC., RILEY STOKER CORPORATION, SEPCO CORPORATION, UNITED CONVEYOR CORPORATION, UNIVERSAL REFRACTORIES, WARREN PUMPS, WEL MCLAIN, AMCHEM PRODUCTS, IMO INDUSTRIES, INC., filed by JOHN B. DEVRIES, ROBERTA G. DEVRIES.(ti,) Modified on

		7/3/2013 (ti,). (Entered: 07/03/2013)
		* * *
10/15/2013	263	MOTION for Summary Judgment filed by WARREN PUMPS.Memorandum, Certificate of Service. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5Exhibit E, # 6 Exhibit F, # 7 Exhibit G)(SCHEETS, JOSHUA) (Entered: 10/15/2013)
		* * *
10/15/2013	269	MOTION for Summary Judgment filed by CBS CORPORATION.Memorandum, Certificate of Service. (Attachments: # 1 Exhibit A, # 2 Errata B, # 3 Exhibit C, # 4 Exhibit D, # 5Exhibit E)(MCSHEA, JOHN) (Entered: 10/15/2013)
10/15/2013	270	MOTION for Summary Judgment filed by GENERAL ELECTRIC COMPANY.Memorandum, Certificate of Service. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4Exhibit D)(MCSHEA, JOHN) (Entered: 10/15/2013)
		* * *
10/15/2013	273	MOTION for Summary Judgment filed by IMO INDUS-

		TRIES, INC..Memoradum, Certificate of Service.(FONTAK, JOSEPH) (Entered: 10/15/2013)
10/15/2013	274	MOTION for Summary Judgment filed by BUFFALO PUMPS, INC..Memorandum, Certificate of Service.(HOWARTH, JOHN) (Entered: 10/15/2013)
		* * *
10/15/2013	277	MOTION for Summary Judgment filed by FOSTER-WHEELER LLC.Memorandum of Law in Support of Motion for Summary Judgment and Certificate of Service. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G, # 8 Exhibit H, # 9 Exhibit I, # 10 Exhibit J, # 11 Exhibit K, # 12 Exhibit L, # 13Exhibit M, # 14 Exhibit N)(JANICZEK, LEROY) (Entered: 10/15/2013)
		* * *
11/15/2013	291	RESPONSE to Motion re 277 MOTION for Summary Judgment *of Foster Wheeler* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2, # 2 part 3, # 3 part 4, # 4 part 5, # 5 part 6,

		# 6 part 7, # 7 part 8)(PAUL, ROBERT) (Entered: 11/15/2013)
		* * *
11/15/2013	294	RESPONSE to Motion re 270 MOTION for Summary Judgment *of General Electric* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2, # 2 part 3, # 3 part 4, # 4 part 5, # 5 part 6)(PAUL, ROBERT) (Entered: 11/15/2013)
11/15/2013	295	RESPONSE in Opposition re 270 MOTION for Summary Judgment *of Plaintiffs* filed by GENERAL ELECTRIC COMPANY. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D)(MCSHEA, JOHN) (Entered: 11/15/2013)
11/15/2013	296	RESPONSE to Motion re 269 MOTION for Summary Judgment *of CBS Corporation* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2, # 2 part 3, # 3 part 4, # 4 part 5, # 5 part 6, # 6 part 7)(PAUL, ROBERT) (Entered: 11/15/2013)
11/15/2013	297	RESPONSE to Motion re 273 MOTION for Summary

		Judgment *to IMO* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2)(PAUL, ROBERT) (Entered: 11/15/2013)
11/15/2013	298	RESPONSE to Motion re 274 MOTION for Summary Judgment *of Buffalo Pumps* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2, # 2 part 3, # 3 part 4, # 4 part 5)(PAUL, ROBERT) (Entered: 11/15/2013)
		* * *
11/15/2013	301	RESPONSE to Motion re 263 MOTION for Summary Judgment *to Warren Pumps* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2, # 2 part 3, # 3 part 4)(PAUL, ROBERT) (Entered: 11/15/2013)
		* * *
10/06/2014	345	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT WARREN PUMPS (DOC. NO. 263) IS GRANTED. ETC. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/1/14. 10/6/14 ENTERED AND COPIES E-MAILED.(va,) (Entered: 10/06/2014)
10/06/2014	346	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT

		OF DEFENDANT IMO INDUSTRIES, INC. (DOC. NO. 273) IS GRANTED. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/1/14. 10/6/14 ENTERED AND COPIES E-MAILED.(va,) (Entered: 10/06/2014)
10/06/2014	347	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT BUFFALO PUMPS, INC. (DOC. NO. 274) IS GRANTED. ETC. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/01/2014. 10/06/2014 ENTERED AND COPIES E-MAILED. (va,) (Entered: 10/06/2014)
		* * *
10/15/2014	350	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT CBS CORPORATION IS GRANTED. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/10/2014.10/15/2014 ENTERED AND COPIES E-MAILED.(uh,) (Entered: 10/15/2014)
10/15/2014	351	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT GENERAL ELECTRIC COMPANY IS

		GRANTED. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/10/2014.10/15/2014 ENTERED AND COPIES E-MAILED.(uh,) (Entered: 10/15/2014)
		* * *
10/15/2014	353	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT FOSTER WHEELER LLC IS GRANTED. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/10/2014.10/15/2014 ENTERED AND COPIES E-MAILED.(uh,) (Entered: 10/15/2014)
		* * *
01/26/2015	364	NOTICE OF APPEAL by JOHN B. DEVRIES. Copies to Judge, Clerk USCA, Appeals Clerk (Entered: 01/26/2015)
01/26/2015	365	Clerk's Notice to USCA re 364 Notice of Appeal : (ti,) (Entered: 01/28/2015)
		* * *
02/12/2015		USCA Case Number 15-1278 for 364 Notice of Appeal filed by JOHN B. DEVRIES. (ahf) (Entered: 02/13/2015)
		* * *

03/03/2016	368	ORDER of USCA as to 364 Notice of Appeal filed by JOHN B. DEVRIES THAT THE CASE IS SUMMARILY REMANDED TO THE DISTRICT COURT TO CONSIDER THESE ITEMS; ETC. (ems) (Entered: 03/03/2016)
05/19/2016	369	MEMORANDUM AND/OR OPINION SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 5/18/16. 5/19/16 ENTERED AND COPIES MAILED, E-MAILED.(ti,) (Entered: 05/19/2016)
		* * *
05/23/2016	371	NOTICE OF APPEAL by JOHN B. DEVRIES; no filing fee paid. Copies to Judge, Clerk USCA, and Appeals Clerk. (ti,) Modified on 5/24/2016 (ti,). (Entered: 05/24/2016)
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IN THE UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF PENNSYLVANIA

In Re: Asbestos Product Liability Litigation	)	Civil Action No. MDL 875
All Actions	)	

AFFIDAVIT OF ROGER B. HORNE JR. RADM USN (RET)

1. I am a retired Rear Admiral of the United States Navy, in which I served between 1956 and 1991. I began my Navy Career in 1956, immediately after receiving a Bachelor of Science degree in Naval Engineering from the Unites States Naval Academy at Annapolis, Maryland. I have also received extensive post-graduate education in naval engineering, including a Master of Science Degree in Mechanical Engineering from the U.S. Naval Postgraduate School, and have taught Naval Engineering as a Visiting Professor at the University of Michigan. Throughout my Navy career, I concentrated in areas of ship design, engineering, construction, overhaul and inspection. Ultimately, I achieved the rank of Chief Engineer and Deputy Commander, Naval Sea Systems Command ("NAVSEA") for Ship Design and Ship Systems Engineering. Prior to that, I served as Deputy Commander, NAVSEA for Facilities and Industrial Management; Commander, Puget Sound Naval Shipyard; Commander, Engineering Duty Officer School; Production and Repair Officer, Mare Island Naval Shipyard; Nuclear Engineering Manager, Puget Sound Naval Ship-

yard; Nuclear Submarine Inspection Officer, Supervisor of Shipbuilding Office, Ingalls Shipyard and Chief Engineer in the USS Ozbourn (DD 846).

I have been involved in the construction or overhaul of over 80 ships and submarines and served at sea. I am proud that these vessels have performed many activities vital to the national defense. Examples of these activities during my tenure include at sea task force operations following the Korean war while doing joint operations with ships of the Southeast Asia Treaty Organization ("SEATO"); shipyard positions including command with significant responsibilities concerning vessels with vital missions during the Cold War and Viet Nam war, as well as, senior positions later in my career with significant responsibility concerning the overall management of industrial facilities in both private and public shipyards as well as the design of new ships.

2. While in the Navy, I was recognized for achievements in the field of marine machinery and engineering, and I have received three National Legion of Merit Awards and three Meritorious Service Awards for Engineering and Industrial Achievement and an award from the Marine Machinery Association.

3. In addition to my training and experience in Navy ship construction as outlined above, upon retirement, I taught part-time at the University of Michigan as a visiting professor in ship construction. Further, in civilian life, I had responsibility for the Marine and Aviation Section at Failure Analysis Associates located in Menlo Park California. On retirement from Failure Analysis Associates I have been involved with many asbestos related legal cases. Exhibit 1 is a true, complete and correct copy of my curriculum vitae.

4. Based on my naval experience and training, general knowledge and review of the materials supplied me, I submit this Affidavit to attest to (a) the Navy's mission and the relevance of equipment design, engineering, construction, repair, overhaul and inspection to that mission; (b) the centrality of equipment and materials such as propulsion turbines, turbine-generator sets and related equipment ("turbines") and asbestos thermal insulation to the Navy's ability to successfully wage wars in the 20th Century; and (c) the importance of Navy designed and Navy controlled asbestos warning procedures.

5. Stated simply, the mission of the Navy is to win wars, deter aggression and maintain freedom of the seas. In the interests of the national defense, the Navy has four primary areas of responsibility concerning ships and submarines: (1) the design and construction of naval forces necessary for effective prosecution of national defense; (2) the maintenance of naval ships and equipment essential to readiness for naval operations; (3) the development of new equipment and weapon systems; and (4) support for its sailors.

6. The country requires a Navy with offensive capability that can project power to discourage aggressive action by other nations. There is never a time when the Navy is not either engaged in combat or preparing for combat by readying its primary war weapons – ships and sailors – for battle. Even in times of "peace" (when the Country is not officially at war or when ships are not engaged in combat), the Navy provides important combat-related services. For example, Navy submarines patrolling international waters have been credited with assisting in the collapse of Soviet Russia during the nuclear arms race between the

United States and Russia commonly referred to as the Cold War.

7. Retaining a trained base of personnel, continually introducing state-of-the-art equipment and materials, and keeping in good repair its ships, aircraft and auxiliary equipment are essential, inextricable aspects of the Navy's national responsibilities. For this reason, the Navy's effort to design, engineer, construct, repair, and inspect its ships, aircraft and auxiliary vessels, whether during operations or in shipyards, was and is critical to the Navy's mission. Without continual training of personnel and construction and repair of its ships and auxiliary equipment, the Navy would not be capable of deterring aggression and fighting wars.

8. The Navy has a chain of command which establishes reporting authority from junior to senior officers and provides for the communication of instruction and orders among Navy personnel. To ensure that all Navy personnel know and understand the chain of command, enlisted personnel are taught it in boot camp and officers learn about it in the Naval Academy and other schools and college programs. This chain of command is crucial to mission success because it provides a single, uniform and effective method of communication. The Navy's chain of command enables the Navy to effectively organize its sailors and prepare them to respond to combat situations and perform a variety of strategic operations at a moment's notice. Obviously discipline is a key element supporting the Navy's mission. Personnel at all levels must be relied upon to carry out the lawful orders of their senior officers. Failure to have this ingrained in

the Navy culture would lead to chaos and mission failure in battle.

9. The Navy chain of command concerning ship construction involves several layers of authority related to technical and contractual control over Navy shipbuilding. The Secretary of the Navy has ultimate authority over the Navy and Navy shipbuilding; immediately below the Secretary, as has been the case since the creation of NAVSEA is the Chief of Naval Operations ("CNO") to whom NAVSEA reports. Prior to the establishment of NAVSEA, the Bureau of Ships ("BUSHIPS") controlled all combat ship design and construction and reported to the CNO as well as a civilian Assistant Secretary of the Navy. Since the creation of NAVSEA, NAVSEA reports to the CNO for all military ship design and construction.

10. The CNO is the top military official in the Navy. The CNO has lead responsibility for all matters of strategy, tactics and operations. Typically, the CNO will identify a threat or a special need, and NAVSEA will design ships and equipment to address the CNO's requirement. Designing a new ship is complex and involves the coordination of many engineering disciplines knowledgeable in the technical state-of-the-art in their individual professional areas. It is easy to understand Navy ships must satisfy a variety of missions and, although some ships can carry out multiple missions, there will be a need for a variety of ships with different designs. Generally the need for ships with specific mission capability will be conveyed to the NAVSEA by the CNO. NAVSEA will respond with concept designs. From this phase NAVSEA will go through a series of design iterations ("design spiral") in coordination with the CNO's staff until finally

a detailed and a contract design is reached for the ship. The design will set the needs for turbines along with other equipment and weapon systems. The Navy has its own engineers who specialize in turbines (machinery experts) and who are familiar with the state of the art for commercial turbines. The Navy's machinery experts do not actually design turbines themselves, but they use their expertise to develop a turbine design concept that contemplates emerging technology and new materials, as well as military tactical needs. Once a turbine design concept has been established, the Navy's machinery experts will consult with commercial turbine manufacturers concerning their turbine concept. Through a complex, iterative process the Navy works closely with turbine manufacturers to attain an ultimate turbine design that meets its new military requirements. The Navy will use previously developed military specifications ("MilSpecs"), create any additional specifications that may be required, and then issue a request for bids from qualified contractors in an effort to identify a contractor with the capability and capacity to create a design and to manufacture a turbine that satisfies its new military requirements.

11. The design of turbines and development of turbine military specifications are essential aspects of the Navy's shipbuilding program. These designs and specifications are built on the totality of the Navy's experience in fighting and planning for wars – what works, what is reliable, operation cycles, maintenance problems, and a multitude of other factors uniquely related to combat conditions. The ultimate design and military specifications for turbines developed by the

Navy reflect the existing state-of-the-art and demonstrate the Navy's operational experience in a variety of circumstances. They reflect the turbine design characteristics that directly impact the combat effectiveness of Navy ships and include among many other attributes the following:

a. Reliability: Turbines must be designed so that they are efficient and provide reliable power to enable the ships to travel long distances over extended periods without undue maintenance.

b. Quietness: Turbines aboard surface ships and, particularly, submarines must operate quietly to help protect the ships from enemy detection.

c. "Battle" Hardness: Turbines must be able to withstand the substantial shock sometimes experienced in battle. Material selection under shock requirements often dictates the use of special materials not found in commercial turbines.

d. Maintainability: Turbines must be designed so that they can be easily maintained at sea and require infrequent repair and overhaul. Turbines also must be designed so that they are compatible with standardized, replacement parts (consumable items) carried in the Navy's stock system.

12. Further, regarding the Navy's organization for controlling material as well as ship construction and maintenance, under the command of NAVSEA (as was the case with BUSHIPS) the Navy's shipbuilding structure is comprised of several divisions and levels of authority concerning equipment design, construction, repair and inspection. The Commander of Naval

Sea Systems and the Commander of Naval Supply direct technical and contractual control over shipboard construction, as well as, equipment and material. Both organizations have oversight responsibility concerning, among other things, equipment built for Navy vessels, as well as, the Navy vessel itself. Compliance with the standards and specifications required for ships and equipment built for Navy use was and is directly monitored by Naval Machinery Inspectors (some specializing in turbines) under both of these divisions. The Naval Machinery Inspectors are responsible to the Head of the Inspection Department for assuring that contractors follow the required military specifications as they relate to naval machinery. Further, the Naval Machinery Inspectors report to their superiors any violations or failures to comply with specifications.

13. At times the machinery inspectors under Naval Supply have worked on-site at the vendors' manufacturing facility for equipment, and the Supervisor of Shipbuilding (reporting to BUSHIPS) had Navy inspectors that carried out their inspection and contractual responsibilities at the shipbuilding yards. At one time in my career, the offices of the Supervisor of Shipbuilding reported to me for administration of the contracts for which they were responsible. Inspectors within the Supervisor of Shipbuilding offices would report to their superiors any violations or failures to comply with specifications.

14. Whether aboard ship or in a shipyard, the Navy Commander is the ultimate authority in all things related to the ship's operation or ship's construction, repair and overhaul, including instructions

that might impact the health and safety of Navy sailors or civilian workers engaged in these activities. The role of civilians both in Navy yards and in private yards was to carry out work in accordance with military specifications. At a Navy Yard, the Navy itself was directly involved in assuring the specifications are followed because everyone in a Navy yard is either an officer or a government contract worker. In a private yard, the Navy would have a local office of the Supervisor of Shipbuilding staffed, with Navy officers who are responsible for supervising all civilian activities and for inspecting and verifying purchasing documents and receiving equipment and material to ensure the ship construction and repair in the private yard conforms to Navy specifications. The Supervisor has to follow the requirements specified or get formal waivers to the specifications of interest from BUSHIPS. Through these means, the Navy has assurance that its ships meet the rigorous requirements of wartime vessels.

15. The attached exhibits illustrate the organizational lines of command for technical and contractual control over Navy shipbuilding. (*See* Exhibits 2 and 3). For a description of the responsibilities of each of the parties reflected on the attached organizational charts, refer to Exhibit 4, a document I prepared which describes in detail each individual's authority and responsibilities and explains how each level of command interrelates in the collective Navy effort to design, build and maintain our Navy fleet. In addition, this description identifies the several federal officers who exercised control over equipment manufacturers, including Westinghouse Electric Corporation ("Westinghouse") and General Electric Company ("GE"),

whenever they built and supplied turbines to the Navy during the past 50 or 60 years.

16. As noted, turbines built for Navy vessels, including Westinghouse and GE turbines, were manufactured according to plans and specifications prepared, written and issued exclusively by the Navy, specifically NAVSEA or BUSHIPS. This is my experience having served as Chief Engineer and Deputy Commander for NAVSEA's Ship Design and Engineering Division. I was responsible to the Commander of NAVSEA for developing ship designs and for overall technical support to the operating fleet, maintenance of ships, and ships under construction. Additionally, I was responsible for the maintenance of Navy ship military specifications and for monitoring compliance with the specifications by all vendors and contractors of Navy equipment.

17. The MilSpecs for Navy equipment were drafted, approved and maintained by the Navy, specifically NAVSEA, to address shipboard equipment and materials requirements, and any changes to those specifications were made by the Navy. NAVSEA maintained and controlled the MilSpecs largely because it had superior knowledge of the demands and requirements of combat-ready vessels. NAVSEA or BUSHIPS also prepared contract specifications which incorporated the MilSpecs. These specifications reflected the state-of-the-art and the special needs of combat and combat support vessels destined to deter or engage in war.

18. The specifications were communicated to Westinghouse, GE and other similar vendors when the Navy issued its Request for Proposal for certain equipment. Attached hereto as Exhibit 5 is a brief

summary of Navy Ship Design and Naval Machinery Military Specifications, as well as a brief summary of the Navy Ship Design/Construction Procedures, which explains how the Navy's machinery vendors were governed by the Navy's specifications.

19. An illustration of the control the Navy exercised over production of its turbines is the process by which turbines were made for the *U.S.S Kitty Hawk*, a Navy aircraft carrier. Examples of the specifications which applied to shipboard equipment for the *U.S.S. Kitty Hawk* are attached hereto as Exhibits 6 and 7. Exhibit 6 is an excerpt of a Military Specification concerning Turbine, Steam and General Auxiliary equipment (Naval Shipboard Use) identified as MIL-T-I7523A (SHIPS) dated 1 August 1955. Exhibit 7 is Bureau of Ships Contract Specification for Generator Set, Steam Turbine, also identified as "SHIPS-G-1956" dated 25 April 1955. Exhibit 8, attached hereto, is a copy of Westinghouse's purchase order for the turbines for the *Kitty Hawk*. This is evident based on the following information: the reference on page l of Exhibit 8 to "CVA 63" is to the ship number assigned by the Navy to the *Kitty Hawk* (CVA indicates it is an aircraft carrier, and 63 is this carrier's number). The Customer Order No. "NOBS-67530" is a reference to the Navy's contract number, i.e. the contract issued by BUSHIPS to Westinghouse to build the equipment described on page l of Exhibit 8. On page 4 of Exhibit 8, there is a reference to "Bureau of Ships Contract Specification SHIPS-G-1956, dated 25 April 1955," which is Exhibit 7. On page 2 of Exhibit 8 is a reference to "MIL-T-17523," which is Exhibit 6, the military specification described above. These documents mean that the Navy ordered from Westinghouse the turbine

equipment described in Exhibit 8, which incorporates the specifications in Exhibits 6 and 7, for use aboard the *U.S.S. Kitty Hawk*. As referenced throughout Exhibit 8, Westinghouse was to perform its work under control of the Navy: e.g. "Inspection: At Contractor's Plant, Essington, Pennsylvania, By the Inspector of Machinery, USN, Essington, Pennsylvania, except Item 2 shall be inspected . . . by the Assistant Inspector of Naval Material, East Pittsburgh, Pennsylvania" (Nme #4, p. 3); "Engineering service shall be performed . . . as directed by the Chief, Bureau of Ships or his duly authorized representative" (p. 4); "Contractor agrees to enter into a standard government contract . . . from the Bureau of Ships or Department of the Navy" (p. 5); "Contractor shall furnish the services of competent engineer(s) . . . as directed by the Chief, Bureau of Ships, or his duly authorized representatives." (Item 7, p. 5.)

20. As illustrated by the *Kitty Hawk* documents, all Navy vessel equipment, including Westinghouse and GE turbines, was built according to Navy specifications and approved for installation aboard these vessels exclusively by the Navy and its designated officers.

21. It should be easy to understand, and it is my experience, that the Navy retained the "final say" over the design attributes of naval ships and their equipment. As the purchaser, and having the engineering expertise and experience as to what was needed for naval combat vessels, the Navy retained final responsibility for the ultimate decision regarding how to resolve any disagreement between the Navy and a shipbuilder or an outside equipment supplier. In the case of private yards the Supervisor of Shipbuilding Office

provided the link between the shipbuilder and BUSHIPS in settling any disputes over Navy requirements. If Navy specifications were not followed by the shipbuilder the Supervisor's inspectors would reject the shipbuilder's involved work. All such disputes were handled formally and any changes required change orders to the contract or formal waivers to the specifications.

22. Considering the above, any and all work performed in the construction and repair of Navy ships noted in this case, as well as, the equipment built and supplied for these vessels was performed to combat requirements developed and specified by the Navy. Further, such work was typically reviewed and inspected by Navy personnel in the vendors' plants and in shipbuilding and repair yards. Such rigid conformance to requirements was absolutely necessary for the construction of a warship which was to take our sailors in harm's way.

23. The military specifications for turbines ensured that each and every turbine ordered by the Navy, regardless of the identity of the specific contract manufacturer, was uniform, complied with the Navy's combat requirements and would operate in the manner demanded by the Navy. This uniformity was critical because the Navy cannot take a ship into battle unless it knows that each component of the ship will satisfy precisely its specifications including those for reliability, quietness, battle hardness and maintainability. These characteristics are vital in total to the success of the ship's mission. The Navy cannot put a ship into harm's way and have it "dead in the "water" due to a limitation in its 'turbines' capabilities. The consequences of such problems — which can include

death, loss of ship or mission failure — are unacceptable to the Navy. Certainly the ship's propulsion plant, including turbines, are as important as the ships' weapons during combat.

24. Based on my experience and knowledge, the Navy required that all turbines be delivered "bare metal," meaning that the turbines were not to be accompanied by any type of insulation at the time of delivery. Pursuant to Navy military specifications, the turbines were designed by the Navy to include only metal rails and hooks, the means through which insulation could be attached. It would not have been possible for contract manufacturers to deliver turbines to the Navy without these rails and hooks because such turbines would not conform to military specifications. Moreover, the Navy did not permit individual turbine manufacturers to insulate their equipment prior to installation because it was more economical, efficient and allowed preoperational inspection and testing to have the ship's entire plant insulated at one time than to have each piece of equipment come with its own insulation. Additionally, the Navy was concerned that pre-installed insulation on turbines could be easily damaged during shipment.

25 It was the Navy, not contract manufacturers, that required the use of asbestos thermal insulation with turbines intended for installation on Navy ships. The Navy had its own engineers with expertise in insulation and heat transfer. These engineers developed their own plans and standards for the insulation of Navy equipment and, with respect to turbine insulation, these Navy engineers determined that asbestos thermal insulation best met the Navy's military

requirements. Asbestos thermal insulation had characteristics that were essential to the proper operation of turbines on Navy ships including: optimum heat retention, low weight, fire resistance, resistance to water damage and insect infestation, and cost-efficiency. Weight, in particular, was a significant factor in the Navy's determination to use asbestos insulation. Although specific amounts varied according to the particular class of ship and propulsion plant design at issue, in general, Navy destroyers overall required approximately 22 tons of asbestos thermal insulation and Navy aircraft carriers as much 300 tons of asbestos thermal insulation. Because asbestos had all of the characteristics critical to insulation on a Navy ship, the Navy had difficulty identifying satisfactory substitutes. Until acceptable substitutes were identified by the Navy beginning in the late-1970s, asbestos thermal insulation was critical to naval ship design and operation. Without proper insulation of the ship's propulsion plant (including turbines, boilers and auxiliary equipment), the ship's plant would be inefficient due to loss of heat and sailors would be burned or unable to operate in engineering spaces due to heat levels. Also, every pound of heavier insulation would displace the amount of weapons or fuel that could be placed aboard ship. For these reasons, Navy specifications demanded the use of asbestos thermal insulation with its turbines and auxiliary equipment for most of the 20th Century. If not for the presence of asbestos thermal insulation, the ship's efficiency would not allow it to operate properly including in combat.

26. In pursuing competitive bids from equipment vendors such as turbine manufacturers or asbestos

suppliers, cost was never the only or over-riding factor in equipment and material selection. All essential equipment placed aboard a Navy ship, including turbines and asbestos thermal insulation, had to meet the requirements of a ship intended to be placed in harm's way.

27. There is no way to battle harden a ship to the extent that no losses to personnel or equipment are ever sustained. For this reason, the Navy continually evaluated the combat benefits of specified equipment and materials against the potential risk to the health and safety of Navy personnel and civilian workers. Under the Navy's command structure, the responsibility for health and safety fell under separate divisions. The CNO was responsible for, and concerned with, issues seen as immediate threats to safety, and the Bureau of Medicine (BUMED) was responsible for medical treatment and issues related to long-term health hazards. The CNO and BUMED and their staffs communicate and coordinate on health issues. At times Navy personnel have to operate in harms way, and the Navy has to use the best material available to that end and control with procedures some health risks if necessary to fulfill its mission. For most of the 20th Century, it is clear that the Navy considered turbines to be "vital" to its combat mission (*see* MIL-T-17600A (SHIPS)) and that asbestos thermal insulation was essential to safe and efficient operation of its ships (*see* Bureau of Ships Manual, Ch. 39, Thermal Insulation (Aug. 24, 1945, Sec. 39-2).

28. The Navy has been aware of the health risk of exposure to asbestos dust since at least the 1920s. Until 1975, when it issued a policy aimed at eliminating the use of asbestos materials where possible, the

Navy believed that it had instituted adequate controls to protect personnel working with or around asbestos materials. However, even as the Navy moved toward elimination of asbestos materials in the late 1970s, the Navy could not immediately eliminate all asbestos and had to place additional measures believed to be necessary to control the health risks understood at the time. Capital steam driven ships had many tons of insulation and to immediately implement a program of total asbestos removal would immobilize the Navy for a lengthy period. Further, replacement material meeting the Navy's stringent military specifications was not available. Rather, the Navy instituted a careful and deliberate asbestos removal program that continued to protect personnel health to the greatest extent possible in light of operational demands including cost concerns. This program provided for replacing asbestos-containing insulation with non-asbestos insulation when repairs were required; leaving in place fixed or intact asbestos-containing insulation but painting the insulation (magenta with a white overlay) to identify the presence of potentially hazardous asbestos materials to workers; continuing to use existing stocks of asbestos-containing insulation in the Navy supply system; and continuing to accept new ships delivered with asbestos-containing insulation into the late 1970s, when a transition could be made commensurate with material availability and ship construction schedules.

29. The Navy's military specifications, which were enforced through the Navy's command structure, were designed to provide clear, concise, directions to all Navy personnel and civilian contractors working

under Navy direction. Not only did military specifications describe the physical equipment and material to be used in Navy ships but they also addressed the instructions considered essential by the Navy to warn individuals working with that equipment and material about potential hazards. For example, military specifications included directions for the painting and labeling of ship systems and equipment as well as the content of instruction manuals to be used in the operation and maintenance of equipment.

30. Military Specifications for technical manuals (MIL 15071) prior to 1957 did not mention warnings. Even when later revisions of the specification did mention warnings (Mil - M- 15071C of 10 Sep. 1957), it was the Navy's intent to include only warnings concerning how someone might be immediately physically injured by their actions or cause serious damage to equipment. It was also specifically noted that such warnings were to be used sparingly as was consistent with real need. These instructions were universally understood by the Navy not to include long-term health hazards such as those presented by asbestos. Even after the hazard of asbestos was more fully understood by the Navy beginning in the mid to late 1960s, the Navy did not require changes to the technical manuals. Instead, the Navy invoked effective internal instructions for the safe handling of asbestos. The Navy had final say, approved the content of technical manuals and had state-of-the-art medical understanding of the dangers of asbestos. Clearly if the Navy thought it necessary it could have required a warning concerning asbestos.

31. Further, the Navy controlled labeling that went on all equipment and materials. It should be

noted that, even with increased knowledge concerning asbestos after the mid to late 1960's, the Navy did not require everything containing or associated with asbestos materials to be labeled as hazardous. In addition to the asbestos thermal insulation used in a ship's plant (turbines, boilers and auxiliary equipment), there were miles and miles of insulated pipe and cable; hundreds, if not thousands, of valves; and other equipment that involved asbestos in some way. Once the additional hazard of asbestos was understood, the Navy developed procedures to control work involving asbestos and to monitor exposure to asbestos dust while, at the same time, seeking and testing new materials to be used.

32. I served in shipyards before and after the Navy's internal asbestos control instructions came out, and was in ships under construction and overhaul daily for many years. It is my opinion that the military specifications and naval instructions were effective in controlling the asbestos hazard while maintaining the benefits associated with asbestos insulation. Labeling of systems or components containing asbestos, even with the Navy's increased understanding of the hazards, was not considered practical for combat and combat support operations and, therefore, was not directed or allowed by the Navy. Instead, the Navy chose to control and make personnel aware of the hazards of asbestos exposures through the strict, effective, procedures required by military specifications and personnel training.

33. In summary, the Navy exercised rigid control over the design, manufacture and installation of essential plant equipment and materials, such as turbines and asbestos insulations, to ensure that this

equipment and material would perform as expected during battle conditions. The Navy also developed and imposed requirements for warnings and documentation necessary for the maintenance of this equipment and material to ensure that personnel, particularly in combat conditions, received only one clear set of instructions that had been approved by the chain of command. Finally the Navy had in place a formal organization at building and repair facilities, and also available to inspect at supplier's plants, in order to assure its combat requirements were met.

34. I can attest that any and all work performed on turbines built and supplied for Navy ships by vendors such as Westinghouse and GE was performed to the requirements specified by the Navy and that the work was reviewed and inspected by Navy personnel in the vendor's plant and in the shipbuilding yards to ensure that the turbines met the Navy's combat needs. As noted earlier, in many instances during my career I personally inspected equipment to verify conformance with the requirements specified, although more immediate supervision typically was exercised by officers and other Navy personnel under my command or the command of NAVSEA or its predecessor, BUSHIPS.

35. Further in summary, I have general knowledge and extensive Navy experience with the comprehensive plans, specifications and requirements that governed the construction of Navy ships and the equipment placed on them. At one time, the engineers that prepared specifications and accomplished ship designs worked under me at NAVSEA. The Navy had general specifications and detailed specifications, as

well as, plans that were invoked by contract. The general and detailed specifications and contract plans also invoked more detailed specifications for the ship design, as well as, for the equipment and material to be used in its construction. Frequently, the more detailed specifications and contract plans noted above would invoke even further specifications so that a shipbuilder had to comply in all aspects of the construction. Such direction also included material referenced in the plans and stocked by the Navy. The Navy developed detailed requirements for the construction, maintenance and operation of warships and auxiliaries in order to ensure the ship's continued ability to operate in combat zones and be maintained with material specified and stocked by the Navy. Adherence to the Navy's specifications was mandatory because lives depended on it.

36. I have extensive experience and knowledge concerning the control exercised by the Navy during the construction, repair and overhaul of ships in Navy yards and private yards. Later in my career, all the Supervisor of Shipbuilding Offices inspecting Navy ships and other contracts reported to me (15 offices nationwide). I have personally inspected ships and equipment during construction, repair or overhaul, to verify conformance with the requirements specified and have given instructions to Navy employed inspectors as to how inspections were to be made. At times I and my inspectors have rejected items that failed to meet specifications. For example, I recall rejecting various piping integrity systems (including valves and gaskets) for failure to meet specifications because they proved to leak during system hydrostatic tests. In another case, testing during sea trials revealed a turbine

bearing leaked oil due to faulty oil seals. These type of rejections occurred frequently during ship construction and repair.

37. Based on my experience, knowledge and research, my opinions are that:

a. The fundamental first step to the Navy's ability to successfully fight wars is the design and construction of its combat and combat support vessels as an integrated weapons system. The design of the propulsion plants aboard these vessels, including turbine design and manufacture and material selection such as insulation, represent vital military combat-related decisions commensurate with state-of-the-art knowledge and industrial capability at the time. Each military specification developed by the Navy related to turbines and asbestos insulation aboard ship were necessary to meet the tactical and strategic military characteristics ultimately required by the CNO, the highest Navy officer. These specifications reflected the state-of-the-art and the special needs of vessels destined to either engage in or support combat activities.

b. Because of the Navy's superior knowledge of the tactical demands and operational requirements of combat vessels and of the availability of processes and materials in support of those needs, the Navy exclusively controlled the detailed specifications for its equipment in its propulsion plants and the type of insulation materials to be used with that equipment. It also exclusively controlled warnings related to

health and safety implications of its selected insulation materials. The Navy could not, and did not, permit any equipment manufacturer or material supplier to interfere with mission success by supplying turbines or insulation that did not expressly comply with Navy specifications or by placing warnings on equipment (or in instructions or manuals accompanying the equipment) without Navy approval.

c. The Navy made calculated decisions on the allocation of its resources in light of its knowledge of the hazards of asbestos insulation and the technical and operational demands of war. The Navy instituted a comprehensive program, both aboard ship and in shipyards, to address the hazards of asbestos in a manner consistent with the unique circumstances of combat and combat-support ships that require the sensitive military balancing of tactical, strategic, and technical needs and budgetary constraints against the placing of sailors and civilian workers in harm's way in the defense of the Country.

I declare under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct, and that if called as a witness, I could competently testify to the foregoing facts, all of which are within my own personal knowledge.

Executed this 19th day of August, 2013.

s/ Roger B. Horne, Jr.

ROGER B. HORNE, JR.

State of Washington

County of _____

Subscribed and sworn to before me this 19th day of August, 2013.

s/ April R. Ihde

Notary Public

My commission expires: 5/10/2017

United States District Court
Eastern District of Pennsylvania (Allentown)
CIVIL DOCKET FOR CASE#: 5:13-cv-00474-ER

DEVRIES et al v.
GENERAL ELECTRIC COMPANY et al

REPORT OF SAMUEL A. FORMAN, M.D.

I. BACKGROUND

1. I am a medical doctor specializing in preventive medicine and occupational medicine. I received a B.A. degree from the University of Pennsylvania majoring in history and biology, graduating *magna cum laude* in 1973. I attended Cornell Medical School, graduating with an M.D. degree in 1977. I also received a degree in public health in 1977 as a result of a joint program with the Harvard School of Public Health. Thereafter, I became board certified in occupational medicine after attending a residency at the Harvard School of Public Health.

2. From 1973 to 1977, I participated in Ensign 1975, a Navy program that permitted me to engage in active duty service and obtain hands-on training during the summers between medical school sessions. My participation in this program gave me background and experience different from that of many other prospective medical officers at that time, because very few medical officers engage in operational and administrative rotations as part of their service and training. In the summer of 1974, I engaged in a midshipmen cruise aboard the *USS Shreveport* (LPD-12) for the purpose of obtaining a general understanding of ship operations outside the medical department. I attended training classes and observed activities in all

parts of the ship including the engineering department, command information center, commissary department, supply and repair divisions, and aviation division. In the summer of 1975, I did a rotation at the Navy Bureau of Medicine and Surgery ("BUMED"), known at times as the Naval Medical Command. While there, I participated in medical administration in the office overseeing all medical training for the Navy and worked directly with a number of high-ranking officers in BUMED, including William M. McDermott, who at that time held the rank of Captain but who later became Deputy Commander of the Naval Medical Command. During this rotation, I had an extended assignment to analyze Navy expenditures for medical education at civilian universities to ensure the Navy's needs were being met. In the summer of 1976, I did a clinical rotation on the general and internal medicine wards at San Diego Naval Hospital, the largest military hospital in the world. By the time I graduated medical school, I had already accumulated approximately six months of active duty service from my summer internships. These internships gave me a fundamental understanding of the needs of sailors at sea, a general understanding of ship operations, including ship propulsion systems, and insight into the leadership and administrative side of the Navy.

3. In 1977, I graduated from medical school and went on full-time active duty in the Navy. I performed my internship at the Bethesda Naval Medical Center in Bethesda, Maryland during 1977 and 1978. I remained on active duty in the Navy until 1983. Thereafter, I continued to work for the Navy as a civilian

employee until 1986. My qualifications and credentials are more fully described in my curriculum vitae (Exhibit A).

4. Over the course of my active duty service in the Navy, I served aboard Navy ships whose primary purpose was to fulfill national defense missions of the United States. Assignments aboard ship, involving duty at sea, included, in addition to the *Shreveport* in the North Atlantic, *USS Duluth* (LPD-6) in the Eastern Pacific, and *USS St. Louis* (LKA-116) in the Western Pacific. At all times, these ships were performing missions and activities aimed at preparing for or deterring combat. In the military setting, a major goal of training is combat readiness. This training is intended to simulate combat and combat conditions. For example, the Navy hands out "battle efficiency" ribbons to ships that perform well in war exercises. Even combat support ships are required to remain ready to assist ships and sailors on the front line and, at times, these support ships must themselves go into harm's way. To achieve its mission, the Navy had to be willing to put life and limb at risk not just on the front line but also in support operations.

5. One of the highest profile operations in which I was involved occurred aboard the *St. Louis*, which was an amphibious attack transport ship deployed at the time to the Western Pacific for the purpose of carrying Marines, cargo (including heavily armored Marine Corps vehicles used in amphibious assault), equipment and supplies to Navy shore-based facilities. In March 1979, President Carter ordered the Navy to rescue a wave of Vietnamese and Southeast Asian refugees who were escaping communist Vietnam and local pirates into the South China Sea. The *St. Louis*

was the first ship of the Seventh Fleet to arrive on the scene. Fortunately the *St. Louis* was able to perform this mission without exchanging hostile fire; however, in order to perform this humanitarian rescue operation, the *St. Louis* had to travel just outside the twelve mile international limit and sail directly into an area threatened by actively hostile Communist interests. This situation represented an intense Cold War scenario, one of but many types of hazardous scenarios and missions for which the Navy must be prepared.

6. In the course of my active duty service, I also worked in Navy shore facilities, including shipyards such as the Long Beach Naval Shipyard. These facilities contributed to the defense of the country by engaging in industrial efforts to construct, repair and overhaul the Navy's combat and combat support vessels. My role was to ensure that the Navy personnel and civilians involved in these efforts performed their duties as safely as possible.

7. From 1980 to l 982, I ran an occupational health clinic at the Naval Weapons Station at Seal Beach, California, and assisted in the medical programs at the Long Beach Naval Shipyard. Among other responsibilities, I assisted in the asbestos medical surveillance program for over 2,000 federal Civil Service employees and uniformed sailors. At any one time, I was following 200 cases of asbestos disease.

8. In 1982, I was assigned to the Naval Environmental Health Center at Norfolk, Virginia. While stationed there, I designed occupational medicine programs with regard to Navy-specific occupational diseases, performed health hazard evaluations, inspected the occupational health programs of government facilities as part of the Navy Occupational

Safety and Health, or "NAVOSH," program, carried out epidemiologic studies, and trained Navy doctors and nurses in occupational medicine.

9. In 1983, a JAG officer for the Naval Medical Command requested that I become part of a team to locate, digest and organize government documents for production in asbestos litigation. Over the next year and a half, I investigated the Navy's historical handling and knowledge of various industrial hygiene issues, including asbestos disease.

10. In 1985, pursuant to Navy orders, I completed my review of Navy knowledge and practice in industrial hygiene, including its awareness of and response to health hazards of asbestos, as a formal assignment. My search for documents took me to the National Archives, other warehouses and storage facilities for records of the Navy's Bureau of Medicine and Surgery. I was given full security clearances for and unimpeded access to these facilities. I also conducted research at private facilities such as Harvard University's Countway Library of Medicine's section for rare books and manuscripts.

11. From my review of countless Navy documents and my studies while employed by the Navy, I acquired extensive knowledge as to the state of Navy knowledge and awareness regarding the hazards of asbestos.

12. Following my research, and with the approval of the U.S. Navy's Bureau of Medicine and Surgery, I published an article entitled "U.S. Navy Shipyard Occupational Medicine Through World War II" in the *Journal of Occupational Medicine*, Vol. 30, No. 1 (Jan. 1988) (Ref. 1).

13. Though I no longer hold any formal position with the Navy, since I left I have been asked on a number of occasions to speak to Navy medical and safety personnel on issues relating to the history of occupational medicine and industrial hygiene in the Navy.

14. I also am currently a Visiting Scientist in the Department of Environmental Health at the Harvard University School of Public Health.

II. DISCUSSION AND OPINIONS

A. Navy Occupational Health and Industrial Hygiene Organization

15. The Navy has always taken responsibility for the health and safety of its uniformed and civilian personnel. It has consistently exercised its discretion regarding hazard recognition and appropriate controls in Navy workplaces. As Navy Captain Ernest W. Brown, M.D., recognized as the architect of the Navy's formal occupational health program prior to World War II, wrote in 1940: "One of the most important concerns of the Medical Department of the United States Navy today is industrial hygiene, especially in navy yard practice." (Ref. 2).

16. This commitment was reflected in numerous other Navy statements and documents. In 1943, Secretary of the Navy, Frank Knox, in a statement cosigned by the Chairman of the U.S. Maritime Commission, E. S. Lamb accompanying "Minimum Requirements for Safety and Industrial Health in Contract Shipyards," stressed the Navy's commitment in this regard:

> The necessity for conserving manpower and promoting the physical welfare, health, and safety of what shortly will amount to one million workers in

> shipyards required that careful observance of standards for the prevention of accidents and protection of health be accorded. Aside from the weight which must be given humanitarian consideration, it is simply good common sense that as much care and attention be given to protecting the human factors in the war production program as is given machines.

(Ref. 3). Similarly, in a 1955 Naval Institute publication called *The Human Machine*, Captain Charles W. Shilling of the Navy Medical Corps described the "paramount importance" of Navy health: "[T]he medical component of the Navy has a heavy responsibility" with a mission to promote physical fitness, prevent and control diseases and injuries and treat and care for the sick and injured. (Ref. 4).

17. While the formal titles have varied over the years, the most senior Medical Corps officer in the Navy is the Navy Surgeon General, who is also the Chief of BUMED and who reports to the Chief of Naval Operations ("CNO"). The Navy Surgeon General has responsibility to spell out health programs, including prevention and injury care, for sailors and civilian workers (as appropriate). Medical Corps, allied health professions and enlisted hospital corpsmen are responsible for advising operational line commands to carry out preventive practices and to provide specialized industrial hygiene services. It is the responsibility of the Navy line authorities (the operational chain of command) to carry out these recommendations.

18. Given the breadth and sophistication of its military and industrial activities, the Navy recognized the need to establish departments and bureaus with specific expertise in scientific and technical areas of

importance. The Navy Medical Department (which encompasses BUMED, among other organizations)

> is actively concerned with all phases of life in the Navy and advises all components of the Navy on matters which may affect the health and well-being of naval personnel. . . . There is a Medical School, a Dental School, and a Medical Research Institute at the National Naval Medical Center, Bethesda, Maryland. There are also numerous other research units established in connection with operational activities throughout the world. . . . [T]he Medical Department and all of its component parts are working with the operational forces of the Navy, in all areas of naval importance.

(Ref. 4 at 275 and 276).

19. In addition to monitoring all health programs including industrial hygiene in both a quantitative and qualitative way, the Navy's Medical Department also originated extensive research activities:

> As it is with other component parts of the Navy, research is an intimate part of the Medical Department activity, the importance of which cannot be overemphasized. Through research we assist in the development of new equipment, new and better methods of care and treatment of various diseases and injuries; help in the problem of adjustment of naval personnel to all of the new and strange environmental situations in which they are placed; and, in general, provide the knowledge necessary for more efficient operation of the Navy.
>
> Research under the cognizance of the Bureau of Medicine and Surgery is accomplished in a large

> medical research institute, in several research laboratories, fleet and shore-based units, and in various naval hospitals. The scope of this research is extremely broad and parallels the total activity of the Navy.

(Ref. 4 at 277).

20. A 1956 Navy training document entitled "Naval Orientation" described the scope of BUMED's responsibilities:

> The Bureau of Medicine and Surgery is responsible for safeguarding the health of personnel of the Navy; the procurement of all medical and dental materials; research in medicine and dentistry; evaluation of the performance characteristics, from the physiological standpoint, of equipment designed for the use in naval service; the determination of standards of sanitation and hygiene; the professional education and training of medical personnel; and the establishment of professional medical and dental standards for clinical methods and procedures.

(Ref. 5 at 177).

21. Among the tasks of BUMED in connection with its research and monitoring activities was the distillation of the results of that experience into practical guidance for the rest of the Navy. The translation of the results of that experience into practices and procedures for Navy personnel, and the communication of those practices and procedures, necessarily involved the exercise of judgment by BUMED in determining what topics, and what specific information on those topics, should be disseminated to Navy personnel. Personnel recipients included officers, enlisted, civil servants and contractors. The communication of

such information was designed to ensure that recipients received precisely, and only, what was deemed appropriate in light of their duties and responsibilities, and the overall mission and operations of the Navy.

22. As a consequence of the Navy's approach to such matters, the knowledge of any individual Navy sailor – even an officer with command responsibilities – with respect to an issue like the hazards of asbestos cannot be taken as representative of the broader knowledge of the Navy on the topic. By design, that individual would have possessed only that knowledge necessary, in the view of BUMED, to the performance of his or her duties. Put differently, regarding asbestos – as with many other health and safety issues – there was extensive information regarding potential hazards and potential protective measures that were consciously not shared with the vast majority of Navy personnel who were deemed not to have a need to know.

23. As a General Medical Officer, I was not permitted to deviate from the standardized programs developed by the Navy Surgeon General for the health of Navy personnel, without approval from a more senior Navy officer except in extraordinary circumstances, such as if a ship was isolated or out of contact with more senior, knowledgeable and experienced officers.

24. All Navy personnel including medical officers must follow their chain of command to maintain good order and discipline. Enlisted personnel are indoctrinated during boot camp and training with the understanding that they must conduct all activities "the Navy way," meaning that Navy orders and instructions supersede any information or directions received from any source outside the Navy. Sailors must follow

orders trusting that their chain of command will have the mission of the Navy in mind and will address safety as best as possible. Unlike in the civilian community, all military personnel who refuse to perform an order could be subject to various penalties pursuant to the Uniform Code of Military Justice ("UCMJ"). Absent extraordinary circumstances, the Navy demands and enforces rigid adherence to the chain of command. It does so because it is the military's method for institutionalizing strategic considerations, highly specialized expertise, and prior experience and then transforming this information in an effective and predictable way into programs and orders for all personnel to follow.

25. Collective and uniform communication and implementation of Navy programs and orders are key to the Navy's operational flexibility. The Navy has numerous sailors with specialized capabilities. The Navy also maintains many ships and multiple shipyards with specialized capabilities. The Navy strives to ensure that each sailor is consistently trained, and that each ship in its fleet is predictably constructed so that it can rely on both the sailors and the ships to perform critical operations without endangering sailors any more than is necessary to achieve mission success.

B. Navy Knowledge of Asbestos-Related Health Issues

26. Consistent with the Navy's interpretation of the importance of industrial hygiene and occupational health, the Navy's programs in these areas have paralleled, and at times led, the development of occupational medicine and industrial hygiene in general, and asbestos-related issues in particular. The Navy's

knowledge in the areas of asbestos and associated health conditions has been quite complete when compared to available knowledge over time, and at least by the early 1940s, the Navy had become a leader in the field of occupational medicine relating to, among other things, asbestos dust inhalation exposure.

27. As early as 1922, the Navy recognized, as exemplified by its instructions to officers published in the *Navy Medical Bulletin*, the health hazards associated with airborne asbestos dust and the appropriate protective measures to prevent asbestos exposure. These included the use of water to dampen dust, exhaust systems to remove dust, enclosed chambers to prevent escape of dust and respirators. (Ref. 6). The Navy's knowledge of potential asbestos-related health problems, and of the means to control against them, continued to expand throughout the following decades, as senior Navy officers actively assessed, evaluated, controlled, and made recommendations concerning Navy policy regarding disease and injury prevention, including asbestos related occupational health hazards.

28. The Navy's health and safety apparatus on the eve of World War II was described in the 1939 Handbook of the Navy Hospital Corps published by the Bureau of Medicine and Surgery under the direction of the Secretary of the Navy:

> The United State Navy is one of the largest of the industries maintained by this Government. An organization has been set up in the Navy to protect its personnel, both civilian and naval. A safety engineer is provided, who acts directly under the Assistant Secretary of the Navy. He has supervision of the safety precautions taken to protect the civilian

> employees in the navy yards, ammunition depots, torpedo stations and the like. He is also a consultant in all matters pertaining to safety aboard ships, at training stations and other Navy Department activities. A naval medical officer is assigned to his office for the purpose of consultation in all matters pertaining to health and safety and to cooperate in devising means by which health may be protected and accidents prevented. Aside from this particular medical officer, all medical officers, dental officers, members of the Hospital Corps and nurses form the balance of the medical staff of this organization. It is essential that each one of these members know and understand the hazards to be encountered in the Navy, the steps to be taken to protect against injury and disease, the treatment of diseases and injuries arising therefrom and the organization of the medical personnel for such purposes. Naval medical personnel are required to perform duties ashore, at sea, in foreign countries, in the air and under the sea. In each of these places a variety of health hazards exist. It is therefore necessary that this [sic] personnel have a thorough knowledge of the industry to which they are attached, the hazards presented, the methods of prevention and the treatment of all injuries occurring.

(Ref. 7).

29. The Handbook of the Navy Hospital Corps also explained that all Navy yards have a commandant who "is responsible to the Navy Department for the protection of employees, as well as Navy personnel, under his command. He is familiar with . . . the health and accident hazards presented." Thus, the Commandant was "responsible for the appointment of the

safety engineers [who will] make inspections and recommend proper protective measures." The Handbook further called for the Navy medical officer to "advise the safety engineer and instruct the employees in safety measures and encourage them to cooperate in protective measures." These safety measures included required "masks for asbestos workers."

30. Also in 1939, the Annual Report of the Surgeon General of the Navy addressed the "Hazard of Asbestos," and described asbestosis as "an industrial disease of the lungs incident to inhalation of asbestos dust for prolonged periods." The Report noted the risk from "continued exposure to present occupational conditions" at Navy facilities, and directed appropriate methods for preventing such exposures, recommending the use of local exhaust ventilation to control asbestos dust exposure for insulators in the fabrication shop. (Ref. 8).

31. At about the same time, Navy Captain E.W. Brown undertook an assessment of asbestos exposure, and its prevention, in Navy yards. In an article entitled "Industrial Hygiene and the Navy in National Defense" published in 1941, Captain Brown prescribed appropriate measures for the prevention of asbestos exposure. These included use of respirators, local exhaust ventilation, and wetting of asbestos containing materials. (Ref. 2).

32. The Navy has historically directed all aspects of policy and procedure addressing the health and safety of Navy personnel. This direction has encompassed policies, practices and procedures to protect workers from dangers posed by exposure to asbestos. Indeed, the Navy has on several occasions over time

rejected offers of assistance from other leaders in the field.

33. For example, in 1941, the U.S. Labor Department's Bureau of Labor Standards offered to conduct inspections of health and safety conditions in Navy shipyards. Navy leaders rejected this offer. In a memorandum to Navy Surgeon General McIntire, Commander Charles S. Stephenson, head of the Division of Preventive Medicine within the Navy's Bureau of Medicine and Surgery, offered "[n]otes for consideration when you call on Assistant Secretary [of the Navy Ralph A.] Bard." Commander Stephenson advised Admiral McIntire that Assistant Secretary Bard

> asks specifically what the policy is concerning invitation of . . . the Bureau of Labor Standards, Labor Department into the Navy Yards to make a survey of the welding and other hazards. I told him that we had never done that sort of work and recommended against it, as I know who [the Bureau of Labor Standards] intends to send if it should be done.

Navy leaders recognized that other government departments had a high level of expertise, while rejecting the offers of assistance:

> I gave Mr. Bard and the two officers present a complete story of the beginning of this controversy from the Federal Administrator's letter: that is, that the United States Public Health Service had four teams of traveling scientists alleged to be able to make surveys of all of the Navy Yards and make recommendations for the correction of such hazards as were discovered.

He then emphasized:

> I told Mr. Bard that this was not considered the best policy, due to the fact that we had medical officers in the Yards and that in practically all instances recommendations of sound character had been made by medical officers. We saw no need of inviting the United States Public Health Service on its own invitation to do this job.

(Ref. 9).

34. The Navy's reluctance to accept these offers of assistance was based on concerns regarding possible upset of labor relations, and also for security at Navy facilities. Stephenson's memorandum makes clear that these concerns originated at the highest levels of Government:

> Likewise, I told him that I had spoken to you and that you had indicated that President Roosevelt thought that this might not be the best policy, due to the fact that they might cause disturbance in the labor element.

(President Roosevelt was familiar with the structure and operation of the Navy's shipyards and other facilities – and in particular with the functioning of the Navy during wartime – from his tenure as Assistant Secretary of the Navy from 1913 until 1920. Admiral McIntire was President Roosevelt's personal physician in addition to being the Surgeon General of the Navy.)

35. Stephenson's positions were taken even in light of knowledge that not all industrial hazards were adequately controlled at Navy facilities: "I doubt if any of our foundries would be tolerated if the State industrial health people were to make surveys of them." Asbestos, too, was discussed as an issue: "I am

certain that we are not protecting the men as we should."

36. Health and safety issues, including those relating to asbestos exposure, continued to be a major focus of the Navy and the United States Maritime Commission throughout World War II. In 1943, the Navy, along with the Maritime Commission declared its responsibility for the safety and health of their workers and took charge of implementing and staffing safety and health programs for those workers. Following extensive discussion with various constituencies, the Navy and the Maritime Commission jointly issued "Minimum Requirements for Safety and Industrial Health in Contract Shipyards" ("Minimum Requirements"). (Ref. 3). The specific requirements imposed by the document enunciated for private and contract shipyards expectations that were already in effect and implemented at the Navy's own facilities.

37. The Minimum Requirements identified asbestos-related disease as a potential hazard of shipyard work, explaining that exposure could result from handling, sawing, cutting, molding and welding rod salvage around asbestos or asbestos mixtures. The document advised that such jobs "can be done safely with:

1. Segregation of dusty work and,
2. (a) Special ventilation: Hoods enclosing the working process and having linear air velocities at all openings of 100 feet per minute, or

   (b) Wearing of special respirators.
3. Periodic medical examination."

The Minimum Requirements also warned that jobs involving exposure to asbestos require "respiratory protective equipment," in particular a "dust respirator." A ventilation supervisor (the safety engineer) was required to be trained to handle the entire ventilation program in the yard, which was to include classes, demonstrations and short talks on proper procedures.

38. The Minimum Requirements further called for employee safety training: "the time for the safety training of an employee to start is at the inception of his employment." "Employees shall have in their possession, and be instructed in the proper use of, all necessary personal protective equipment before being started on any job." Safety bulletin boards were to be located at each hull and shop, with "[s]afety posters and other material on the bulletin boards" changed at least semi-monthly. The type of safety posters used in these worker educational campaigns included materials reinforcing the use of masks for protection against disease-causing dusts. One such poster stated, "His mask keeps him on the job." (Ref. 10).

39. This commitment by the Navy to address the asbestos-related health concerns of Navy workers, as set forth in the 1939 Handbook of the Hospital Corps and the Minimum Requirements document, is further evidenced by dozens of other documents generated by the Navy and consultants it retained during the war years.

40. Later in the war, following extensive study of asbestos-related health issues, Dr. Philip Drinker, a Harvard professor and Chief Health Consultant to the Division of Shipyard Labor Relations and consultant to the Navy Surgeon General since 1941, wrote on January 31, 1945 to Captain Thomas J. Carter at the

Navy's Bureau of Medicine and Surgery. In his letter, he reported on analyses of airborne dust collected at Bath Iron Works, a leading contractor for construction of Navy vessels. Dr. Drinker summarized the results of the analysis: "This evidence is enough to indicate a fairly serious dust risk at Bath and to make it very probable that the same sort of thing will be found in other plants and yards where the same type of [asbestos] pipe covering materials are used." (Ref. 11).

41. In addition to asbestos health concerns revealed at Bath Iron Works, experience in some of the contract shipyards also came to the attention of Dr. Drinker and Navy authorities:

> I suggested to Admiral Mills that it would be very desirable for Navy to examine men handling the preparation of [asbestos] pipe coverings and their installation in at least two Navy Yards and two Navy contract yards as this is much more a Navy than a Maritime problem because the materials are used especially on Navy vessels with high pressure steam power plants. Admiral Mills agreed that such studies would be wise before Navy or Maritime accepted this asbestos risk as being significant in our general ship construction program.

(Ref. 11).

42. Dr. Drinker and his Navy colleagues published the results of the study he had suggested in W.E. Fleischer, et al., "A Health Survey of Pipe Covering Operations in Constructing Naval Vessels," 28 *Journal of Industrial Hygiene & Toxicology* 9–16 (Jan. 1946). (Ref. 12). The study reaffirmed the Navy's position regarding acceptable occupational dust exposure levels and dust control strategies. They offered

the conclusion that "[asbestos] pipe covering is not a dangerous trade."

43. The conclusions of this study were carried into practice in Navy workplaces following World War II. The January 1947 issue of the Navy's *Safety Review* publication noted that "[e]xposure to asbestos dust is a health hazard which cannot be overlooked in maintaining an effective industrial hygiene program." (Ref. 13).

44. Also during the second half of the 1940s, the American Conference of Governmental Industrial Hygienists ("ACGIH") evaluated the issue of asbestos exposures. This entity, comprised entirely of industrial hygienists with links to the government and academia, published threshold limit values for acceptable exposures to asbestos dust in the workplace. These standards were periodically updated over the years. Representatives of the Navy, trained as industrial hygienists, participated in the ACGIH. In recognition of the potential hazards associated with exposure to asbestos dust, a 1955 Navy Bureau of Medicine instruction adopted the ACGIH's threshold limit value for exposure to asbestos dust among Navy personnel. (Ref. 14). The 1955 threshold limit value as promulgated in the Navy instruction was the same level to which the Navy had sought to control exposures during World War II.

45. During the 1950s, the Navy continued to prescribe safe work practices to address potential shipyard hazards associated with exposure to asbestos dust. For example, a 1950 General Safety Rules Manual issued by the Puget Sound Naval Shipyard in-

structed workers to "[w]ear dust type or air-fed respirators for . . . handling amosite [asbestos] insulating materials. . . ." (Ref. 15).

46. In 1957, the Navy convened at the Boston Naval Shipyard a "Pipe and Copper Shop Master Mechanics' Conference" to address issues of concerns to those in the pipefitters' trade. At the conference were personnel from all twelve Navy shipyards and the Navy's Bureau of Ships in Washington, D.C.

47. The prepared remarks of a Long Beach Naval Shipyard official, included in the Minutes of the Conference reflect the Navy's stated policy that pipe insulators and laggers who handle asbestos products should wear respirators:

> Asbestos, when handled dry, produces vast amounts of silica dust. . . . [T]he material can be dampened to reduce the amount of dust liberated. However, the specified type of amosite [asbestos] for use on cold water piping is water repellent. Also material which must be removed from an existing installation is dry and powdery, being an excellent dust producer. . . .
>
> [D]uring 1956 eleven deaths from asbestosis were reported on the Pacific Coast alone. . . .
>
> I know that two of my insulators are now afflicted with this condition. How many more will become afflicted is something which I hesitate to predict.
>
> Again the solution is obvious. Remove the cause by substituting other products. . . .
>
> In the meantime, the answer is the wearing of respirators by all who handle asbestos products.

(Ref. 16).

48. A New York Naval Shipyard official added that if those working with asbestos insulation have not been "told . . . to put on masks, you are more or less the cause of their trouble." That same official added:

> I think everyone, who has people doing this type work, should warn their people regarding the handling of this material. With the proper handling of it on the job, and it has always posed a very big problem, because the men don't want to wear the masks, or get this dread disease. It is difficult to protect them. After a couple of years of mandatory wearing masks, I think they should realize the danger. I think everyone ought to enforce the wearing of masks. Don't forget this is something that injures people's health. We should do something about it- and fast, and I am convinced that what we are doing is not enough. We should not have people handle this material withou[t] protection.

49. On January 7, 1958, the Department of the Navy issued a "Safety Handbook for Pipefitters," which explicitly addressed the asbestos hazard and again set forth Navy policy for controlling this hazard. (Ref. 17). This handbook – one of many safety handbooks issued by the Navy – stressed that "[a]sbestos dust is injurious if inhaled," and warned those working with asbestos insulation materials to "[w]ear an approved dust respirator for protection against this hazard."

50. During this time period, study of asbestos-related health issues was ongoing at various Navy facilities. For example, Occupational Health Hazards Releases from the Navy's Bureau of Medicine and Surgery on February 1, 1961 (Ref. 18) and May 1, 1961

(Ref. 19) reported on studies of personnel engaged in the handling of asbestos-containing materials and on recommendations, including the use of respirators, exhaust systems and worker training at Puget Sound Naval Shipyard. A 1961 Marine Pipe Covering and Insulating Manual at Puget Sound set forth "General Safety and Health Practices" that included instructions to "[h]andle amosite . . . materials carefully to avoid [its] dust[]," "sprinkle amosite with water whenever possible to keep dust down," and "[s]ee that your chest is X-rayed at least once a year to detect the possibility of . . . asbestosis." (Ref. 20).

51. Concurrently, similar activities were ongoing at Long Beach Naval Shipyard, which had "continuous health education program for . . . asbestos workers" at Long Beach Naval Shipyard, including a showing of a film entitled "The Air We Breath," followed by "a short discussion of the hazards of breathing asbestos fibers and the use of dust respirators." (Ref. 21). Beginning in 1958, health personnel at the yard had begun "a study . . . of pipecoverers (asbestos) working conditions" at Long Beach Naval Shipyard. The study had commenced in 1958, and it included "[c]hest x-rays and vital capacity test[s] . . . on [792] asbestos workers. The report also noted that at the time the study began, a "former [Long Beach] employee was receiving compensation for asbestosis." (Ref. 22).

52. Similar investigation and study was ongoing at other Navy facilities. In September 1962, a Navy Department Occupational Health Hazards Release reported that at Boston Naval Shipyard "[a] study was conducted to obtain current data for evaluating the exposure of pipecoverers to asbestos containing dust." The study involved the collection of samples taken in

the pipecoverers' shop and also aboard ship. The results showed that "[d]ust concentrations found in the general atmosphere of the shop were within permissible exposure limits at the time of sampling," but that "[t]he excessive dust counts obtained aboard ship, emphasized the need for the wearing of approved dust respirators by pipecoverers." (Ref. 23). A few years later, another Release described the results of "[r]andom dust counts . . . aboard ship during the removal of amosite insulation from two fire room boilers" by two pipecoverers. Navy personnel observed that "[o]ther tradesmen working the same work area as pipecoverers are also quite often exposed to the asbestos containing dust and usually remain in the area sometime after the pipecoverers," and "emphasized that respiratory protection should be provided whenever long exposures to high dust concentrations" occur. (Ref. 24).

53. The ongoing development of the Navy's policies and practices to protect workers from asbestos-related health concerns during the early 1960s was reflected, for example, in an article entitled "Asbestosis" published in the October 1962 issue of the Navy's Internal *Safety Review* publication by Captain H.M. Robbins, a Navy physician, and W.T. Marr, a Navy industrial hygienist from the Long Beach Naval Shipyard. The article addressed the potential for exposure to asbestos aboard ships:

> Aboard ship, a great variety of insulation is performed. Insulation blocks are shaped with a saw, pads are supplied to fittings, insulation cement is applied to blocks and covered with asbestos cloth. These and other operations take place in nearly all compartments; however, most work is done in the

> machinery spaces. By far the greatest potential exposure to asbestos fibers occurs during ripout of old insulation for ship overhaul or reconversions.

The article concluded that "[t]he worker's best protection is to avoid careless creation of dusty conditions, use damp material when possible, and wear respiratory protection constantly." (Ref. 25).

54. In 1968, the Navy came under scrutiny for its handling of asbestos-related health issues. On July 30, 1968, Murray C. Brown, Medical Director of the Public Health Service, wrote to Vice-Admiral R.B. Brown, the Chief of the Navy's Bureau of Medicine and Surgery, stating that "[o]ne of our grantees, Dr. Irving Selikoff of New York University, has recently completed a study of non-insulation shipyard workers' exposure to asbestos," and that "Dr. Selikoff reports he has some interesting data and has requested that we arrange an information meeting with your Department and the U.S. Department of Labor to discuss his findings." (Ref. 26). On December 5 of that same year, Admiral Brown reported to others in the Navy health establishment that "Doctor I.J. Selikoff of Mount Sinai Hospital, through the news media, stated that he has warned the Navy and other Federal departments of his findings relating to the unusual incidence of asbestosis among shipyard asbestos workers. The newspaper articles stated that the Federal agencies including the Navy have not publicized the hazards." (Ref. 27).

55. In a "Hazard Analysis" commissioned in response to this external criticism of the Navy's safety practices, Commander Rosenwinkel of the Navy's Bureau of Medicine assured that:

> [T]he Navy's shipyards have for many years been aware of the hazards of asbestos and have initiated appropriate safety precautions. Insofar as possible, all fabrication work [with insulation] is performed in the shops where adequate safety precautions can be observed. These precautions include controlled ventilation, use of respirators, and wetting down of the material. During "rip out" operations, respirators are worn and ventilation is controlled as far as possible.

Similar language was prepared "for inclusion in a statement to be issued by Rear Admiral J.J. Stilwell, Shipyard Management Directorate":

> The United States Navy is well aware of the hazards of asbestos to its employees engaged in ship construction and ship repair at naval shipyards. Hazard control measures implemented by the shipyard medical departments and practices are in accordance with accepted standards of industrial hygiene practices in the United States. Stringent efforts are directed at keeping the concentration of air borne asbestos dust below the level recommended by the American Conference of Governmental Industrial Hygienists. An energetic periodic physical examination program insures the health of personnel exposed to this hazard.
>
> For more than two years, the Naval Ship Systems Command and the Commander of Boston Naval Shipyard have been cooperating with a prominent investigator in a study whose ultimate goal is to define safe working conditions with respect to air home asbestos. Upon the development of further objective, well founded recommendations for the control of this hazard, the Naval Ship Systems

> Command, in cooperation with the Bureau of Medicine and Surgery, will take the necessary steps to implement them at the naval shipyards and all naval activities.

(Ref. 28). The message was clear, and consistent: the Navy would handle asbestos issues in its own way and through its own channels.

56. The development of the Navy's policy towards asbestos-related health issues, and of its program for addressing asbestos exposure to Navy personnel, continued into the 1970s. On February 9, 1971, the Commander of the Navy's Ship Systems Command issued to numerous Navy bureaus and commands its Instruction 5100.26. That document began by recognizing that:

> [t]he most critical use of asbestos in the Navy from a safety viewpoint is in the fabrication, installation, repair or removal of pipe and boiler insulation materials. Some workers sustain accidental contacts either while employed in various capacities where asbestos products are processed or when working in plant areas in which an environmental pollution of the air exists due to asbestos.

In light of these concerns, the purpose of the document was "to prescribe appropriate safety precautions during the use of asbestos," and it decreed that:

> [t]he following safety precautions will be observed by all supervisors and workers engaged in the fabrication, installation and/or removal (ripout) of asbestos-containing insulation material. The provisions of this instruction will be effective as of this date. The provisions in this instruction are considered as minimum health and safety requirements.

More stringent restrictions may be applied by local commanders.

The document then listed nearly fifty specific work practices to be employed to protect workers from asbestos exposure in handling or working in the vicinity of asbestos-containing products. (Ref. 29).

57. In the years that followed, Navy authorities promulgated a series of expansions and refinements of its program for addressing asbestos exposure to Navy personnel. Among the numerous iterations were the following:

a. BUMED Instruction 6260.14 (June 7, 1973) (Ref. 30);

b. OPNAV Instruction 6260.1 (April 9, 1974) (Ref. 31);

c. NAVSEA Instruction 5100.2 (October 24, 1975) (Ref. 32); and

d. NAVSEA Instruction 5100.2A (September 11, 1979) (Ref. 33).

58. Despite the promulgation of such control procedures, there continued to be instances of airborne asbestos dust for certain operations, exceeding then-current standards, inconsistent use of respirators and other control measures even when recommended by Navy authorities, and incomplete understanding of the hazard by the workers involved. The Navy was aware that execution of its own programs in this regard was uneven despite its efforts.

59. Similarly, a January 23, 1974 Navy Department of Occupational Health Hazards Release reported that at Charleston Naval Shipyard "[a] survey was made aboard ship while Temporary Service Shop

electricians were preparing and installing asbestos cloth and rope under a boiler. . . ." Measured dust concentrations exceeded the permissible exposure limit. Navy personnel observed an "ill-fitting" respirator on one of the workers, and described work methods that were

> improper for control of asbestos dust. No signs were posted to warn that asbestos dust was being generated and that dust respirators were required. Asbestos waste . . . w[as] handled with poor technique and not conductive [sic] to minimizing asbestos dust generation. . . . An immediate conference was held with the cognizant General Foreman and all violations of asbestos control instructions, poor work techniques, fit of respirators, and asbestos disposal were discussed.

It was also noted that "[r]emoval of asbestos lagging aboard ship creates a high asbestos fiber concentration in the work environment." Navy personnel observed that "[c]ontrol of asbestos dust contamination throughout the rest of the ship is not guaranteed, and unfiltered exhaust ventilation to the outside of the ship is undesirable," and recommended purchase of a "portable exhaust blower, equipped with and EPA approved cleaning system." (Ref. 34).

60. The same Release also reported that at Long Beach Naval Shipyard

> [d]uring routine monitoring of pipecoverers and insulators performing ripout of asbestos insulation in posted engineering spaces, it has been observed that ship's personnel frequently ignore the warning signs and move through the restricted areas. Ship's

> personnel also have been observed removing asbestos insulation without using respiratory protection and using air hoses to blow down spaces contaminated with insulation dust. An increased effort is being made to indoctrinate the shipboard personnel regarding the dangers of exposure to asbestos dust.

(Ref. 34).

61. The Navy was committed to maintaining complete control over existing military specifications, policies and procedures with respect to asbestos-containing materials and worker practices with those materials. The Navy maintained a fierce autonomy over hazard recognition and control, because the Navy considered itself the ultimate authority on naval systems and military workplaces. Regardless of the source of other information, the Navy viewed its unique knowledge as a strategic advantage in addressing hazard identification and control in its workplaces.

70. In the effort to achieve its mission, the Navy made trade-offs between the use of asbestos and the potential health impact on personnel. In the Navy's judgment, the beneficial aspects of asbestos from an engineering standpoint (technical performance, cost, weight, etc.) made it the best thermal insulation available and a critical war material. As knowledge of asbestos health risks evolved, the Navy made sensitive military mission-related decisions about deriving the benefits of asbestos while controlling its risks. Moreover, when the hazards of asbestos became more fully known to the Navy and the scientific community in the late 1960s, the Navy determined not to do an immediate fleet-wide elimination of asbestos. At the time, Navy leaders were concerned that a large scale, immediate asbestos removal program would pose at

least three problems: excessive cost; mission impairment; and increased health hazards to removal crews from disturbing fixed, in-place asbestos.

71. The Navy asserted for itself the role as final arbiter of what was best with respect to industrial hygiene in its unique workplaces to carry out its national defense mission. The Navy's reasons for this approach include: harmonizing industrial hygiene with its overall operations; maintaining security of its facilities; and unifying communications to its workers.

72. The Navy rejected participation from manufacturers in its efforts to alert its personnel to potential asbestos hazards in Navy operations. The Navy pursued the issue in its own way. Professor Drinker recorded:

> I met with the manufacturers of the materials used at Bath and they stated they would be glad to get out a brief statement of precautions which should be taken in the light of their own experience and that they would inform their competitors that I had asked them to do so. I understand that neither Navy nor Maritime wants any change in the specifications as the performance with the present materials is entirely satisfactory. From a health standpoint we do not believe any specification changes are needed.

(Ref. 11.)

73. BUMED, through a litany of instructions, bulletins and other communications, developed work practices and procedures designed to take what BUMED deemed to be appropriate precautions against workplace and environmental hazards to Navy personnel.

74. Not surprisingly, in my research, I have not located a single instance in which the Navy, at any time during the 1930s through the 1960s, instructed or permitted a supplier of engineering equipment to a vessel or facility to affix or provide any asbestos- related warning with its equipment. The Navy has not depended on equipment warnings in its workplaces concerning long-term occupational health issues. Rather than depending on equipment signage or labeling, the Navy put its efforts into work practice training, specifications for materials being used in its unique workplaces, and the hierarchy of industrial hygiene controls.

75. The Navy's approach to the protection of its personnel from health hazards — and the lack of a role for equipment manufacturers in that process — is exemplified by the Uniform Labeling Program, SECNAV [Secretary of the Navy] Instruction 6260.3. (Ref. 44).

76. The Uniform Labeling Program had as its stated purpose "to standardize on [sic] labeling requirements for hazardous chemical products. . . ." It did not require any actions of parties outside of the Navy, including manufacturers of equipment. It is also clear that the Navy's Uniform Labeling Program was strictly an internal document. In other words, the program was designed by the Navy, for implementation by the Navy. It was not intended as a set of requirements governing the activities of outside parties. The Uniform Labeling Program is an internal Navy program whose addressees are Navy Commands: "Scope: The instruction applies to the labeling of all hazardous materials throughout the Naval Establishment wherever distribution of hazardous chemical

and materials is made to the actual consumer (shop, office, or unit)." (Ref. 44).

77. The internal nature of the Uniform Labeling Program is evident from its provisions:

(a) The Navy Department Standardization Office was directed to assign a Navy project to "standardize the printed labels in respect to quality of paper, size, color, shape, insignia, wording, and design; quality of the glue; specifications for inks including colors of inks); and other related matters." (Ref. 44 at 4.a.);

(b) The Navy's Bureau of Supplies and Accounts was directed to "initiate procedures to have the necessary labels stocked as General Store items for use by all naval activities." (Ref. 44 at 4.b.);

(c) Classification of hazardous chemicals was to "be accomplished through the joint efforts of the technical bureaus in that each Bureau shall be responsible for passing on those aspects, of any single item, which fall within its technical purview." (Ref. 44 at 4.c.).

(d) The document listed the responsibilities of a Navy Safety Precautions Board, and of Navy bureaus and offices, and of the Marine Corps, in implementing the program. (Ref. 44 at 4.d & 4.e.).

78. The Uniform Labeling Program expressly states that it does not impose any requirements on manufacturers of products. Consistent with its focus on chemical materials and substances, the document makes reference to container labeling that may be necessary for intrastate or interstate shipping, and to

labeling by "manufacturers of chemicals" in accordance with Manufacturing Chemists' Association guidelines. (Ref. 44 at 2.a.).

79. The Uniform Labeling Program was prompted by "[t]he rapid development of new chemical products and the introduction of new chemical processes," and by the Navy's view that "[w]arning labels affixed to containers of hazardous chemicals are one of the most practical means of accomplishing th[e] objective" of ensuring that Navy personnel take "precautionary measures . . . during the handling of toxic and dangerous chemicals." (Ref. 44 at 3).

80. Throughout the SECNAV Instruction describing the Uniform Labeling Program, the focus is on chemical products, and on the appropriate labeling for containers of chemical products. The document includes as an enclosure an alphabetical listing of materials it covers, all of which are toxic chemicals or materials. There is no mention of or suggestion that the program has any applicability to equipment such as pumps or valves, or to products such as gaskets or packing, or does the Uniform Labeling Program anywhere mention asbestos.

81. The documents referenced in the Uniform Labeling Program also refer to labeling of containers of hazardous chemicals. For instance, there is reference to the Manufacturing Chemists' Association's Manual Ll, "A Guide for the Preparation of Warning Labels for Hazardous Chemicals." (Ref. 45). Like the Uniform Labeling Program itself, Manual L1 expressly states that it is intended to provide information to "every person using, handling or storing *chemicals*." It expresses the view that "[t]he most practical means" of

disseminating such information is "by warnings affixed to containers of hazardous *chemicals*." (Ref. 45 at 5 (emphasis supplied)). There is nothing in the document to suggest that it relates to instructional or other documentation accompanying machinery or equipment, or that it relates to finished products such as gaskets or packing.

82. That the Uniform Labeling Program imposed neither internally within the Navy nor on manufacturers of machinery or equipment any responsibility for labeling of asbestos-containing materials is belied by the Navy's own implementation of the program is exemplified by a January 15, 1960 Occupational Hazards Release summarizing significant information on occupational health and industrial hygiene from through the Navy and distributed by the Chief of the Navy's Bureau of Medicine and Surgery. The document reported on the review by a Navy shipyard of new products "[i]n accordance with SECNAV Instruction 6260.3 and BUSHIPS Instruction 6260.3 on labelling toxic materials." With respect to "Hy-Temp Block Insulation," an insulating material containing 12–15% asbestos, the Navy concluded as follows: "No label." (Ref. 46). The fact that the Navy determined that no hazard label was appropriate for an asbestos-containing insulation material of the type whose hazards it had been aware of and discussing since the 1920s is inconsistent with the notion that the Navy sought, or would have accepted, asbestos-related warnings affixed to equipment or machinery or in technical documentation relating to such items.

83. The Navy's 1969 Consolidated Hazardous Item List, NAVSUP Publication 4500 issued more than a decade later, had the same focus and purpose

as the Uniform Labeling Program. (Ref. 47). The document expressly governed the labeling of "containers," and it stated that the purpose of labeling it requires is "to warn users of the potential dangers involving the use of the material in the container." (Ref. 47 at VJJI). There was no suggestion that the document applied to equipment or its manufacturers. Like the Uniform Labeling Program, the Consolidated Hazardous Item List is an internal Navy document, describing procedures intended to be implemented by the Navy.

84. Nor were military specifications among the means by which the Navy sought to protect its personnel against long-term health issues such as asbestos exposure. Rather, protection against such hazards was undertaken, through the Navy's Bureau of Medicine & Surgery, through a comprehensive system aimed at identifying evaluating potential threats to the long-term well-being of Navy personnel and developing appropriate training and procedures to mitigate those threats. While military specifications were outward looking – directed to vendors outside the Navy – development and implementation of protective measures regarding asbestos was viewed as an internal Navy issue.

85. The language in military specifications governing technical manuals for equipment is consistent with my overall experience that the Navy did not view manufacturer labeling or warning as an important, or in many instances an appropriate, means of protecting against exposure to ubiquitous, well-known, long-term potential health hazards such as asbestos. For example, MIL-M-15071D, dated June 6, 1961 and governing "Manual, Service (Instruction Books) for Shipboard Electrical and Mechanical Equipment" stated

that use of cautionary language "should be as sparing as is consistent with real need." (Ref. 48 at para. 3.3.6).

86. Consistent with my experience that the Navy saw little value, and much potential for confusion, in extensive use of caution labels addressing common hazards or conditions, particularly when no threat of immediate injury or harm to individuals or equipment was present, the Navy's directed that warnings in technical manuals be "sparing." Rather than depending on equipment signage or labeling, the Navy put its efforts into work practice training, specifications for materials being used in its unique workplaces, and the hierarchy of industrial hygiene controls.

87. The kinds of warnings the Navy did permit in equipment technical manuals underscore that the Navy's focus in this regard was on immediate hazards to life and equipment operation as being appropriate for inclusion in equipment manuals. Such warnings were related to materials that presented immediate hazards to life and equipment, including, for example, solvents which have long been recognized as material that present both inhalation and flammability hazards. Both of these hazards can, of course, result in immediate, severe injury or damage.

88. Similarly, carbon tetrachloride which, while a solvent, is not flammable, is hazardous based in part on its potential to break down and release toxic phosgene gas at elevated temperatures. The release of phosgene gas, which was used as a chemical weapon during World War I, presents a risk to users or others in the vicinity of poisoning.

89. The potential for immediate injury due to inhalation or explosion presented by solvents presents a

hazard fundamentally different from the type of disease risk that the Navy has long known to be associated with exposure to asbestos.

90. An acute injury or accident hazard of the type associated with solvents is a type of "safety" risk long viewed by the Navy as the responsibility of safety officer and the line command. By contrast, asbestos presents a long-term, environment threat to "health" of personnel. The Navy has traditionally handled such health risks under the technical purview of the medical department. The fundamental distinction between safety and industrial health is evident, for example, from the "Minimum Requirements for Safety and Industrial Health in Contract Shipyards" (Ref. 3), which present separately "Minimum Requirements for Industrial Health" and "Minimum Requirements for Safety."

91. As a consequence, the fact that the Navy permitted, or perhaps required, warnings regarding solvents in some equipment technical manuals does not mean that the Navy likewise wanted, or would have permitted, asbestos-related cautionary language in those documents during the period in question.

92. Despite numerous opportunities, Navy health authorities declined to adopt requirements for product labeling relative to asbestos-related health hazards within the Navy, much less as a requirement for suppliers of equipment for inclusion in technical manuals or other documentation.

93. For instance, the Navy's 1922 *Navy Medical Bulletin* lists "four effective methods [wet methods, exhaust systems, enclosures and respirators] that

may be used to prevent the inhalation of dust generated during industrial processes." While the document states that "[n]o one of these can apply to all conditions" and "the particular method to be used must be adapted to the peculiarities of the process," there is no mention among the potential protective measures of labels or warnings on packages or instructions for asbestos-containing materials. (Ref. 6).

94. Similarly, the "Minimum Requirements" adopted by the Navy and the Maritime Commission in 1943 contained no reference to or recommendation for labeling on packages or instructions among its recommended safety practices for handling asbestos-containing materials. Rather, the document stressed segregation of work areas, ventilation, respirators, and periodic medical examinations for workers handling asbestos-containing insulation materials. The only references any kind of signage was to "posters and other material" to be posted on bulletin boards on ships and in land-based facilities. (Ref. 2).

95. Decades later, the Department of the Navy's Instruction 5100.26, while comprehensive, made no recommendation and imposed no requirement that packaging or instructions for asbestos-containing products contain warnings regarding potential hazards. Among dozens of required work practices and procedures, the Instruction required the posting of "adequate warning signs" at the entrance to insulation fabrication shops and around areas where removal of asbestos-containing insulation was being conducted:

1. RESTRICTED ACCESS
ASBESTOS FABRICATION AREA

2. RESTRICTED ACCESS
ASBESTOS INSTALLATION/RIP OUT
WEARING OF RESPIRATORS REQUIRED

Thus, the Navy continued its practice of controlling asbestos exposure through restrictions on access, training and implementation of appropriate work practices and equipment. (Ref. 36).

96. Only in 1973, in BUMED's Instruction 6260.14, did the Navy direct its personnel that

> [c]aution labels shall be affixed to all raw materials, mixtures, scrap waste, debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers occur in excess of the permissible exposure concentration.

The Navy specified the content of the required caution labels. I am not aware that at that time the Navy took any steps to require manufacturers of equipment to place asbestos-related warnings on their products or in literature that accompanied them. (Ref. 37).

C. Gaskets and Packing

97. With specific reference to potential hazards associated with the handling of asbestos-containing gaskets and packing, I am aware from my research and from my personal experience in the Navy that these materials were regarded as negligible sources of asbestos exposure. For example, a December 9, 1968 U.S. Department of the Navy Memorandum regarding "Hazards of Asbestos" stated that

> [a]ll of the asbestos in [gasket and packing materials] is fabricated as cloth, rope or compressed sheet with binders, so that the items are not friable when they are cut. Thus, these items do not cause dust in shipboard applications. In addition, in many instances, they are received already incorporated in the finished assembly such as a valve, and do not require fabrication by the shipyard. For these reasons, packings and gaskets containing asbestos are not considered to be a significant health hazard.

(Ref. 32).

98. This conclusion was reaffirmed in the published literature by P.G. Harries, who made extensive study of asbestos exposure in shipyards in the United Kingdom. In "Asbestos Dust Concentrations in Ship Repairing: A Practical Approach to Improving Asbestos Hygiene in Naval Dockyards," *Ann Occup Hyg 14*: 241–254 (1971), Harries concluded that asbestos-containing gaskets, which he referred to as "high temperature jointing and packing materials," presented "[n]o health hazard in forms used in shipyard applications." He also noted that "[n]o substitute heat-resistant material is available" for asbestos in these applications. (Ref. 49).

99. A 1973 publication of the International Agency for Research on Cancer – *Biological Effects of Asbestos* – stated that "[t]here is no conceivable health risk in the use of asbestos-based gasket materials." (Ref. 50 at p. 325). Well-known asbestos researcher and health advocate Dr. Irving Selikoff wrote, in his 1978 book *Asbestos and Disease* that "[h]igh temperature jointing and packing materials" containing "[a]sbestos fiber" and "(c]ompressed asbestos fiber"

present "[n]o health hazard in forms used in shipyard applications." (Ref. 51 at p. 267).

100. The lack of concern for asbestos exposure from asbestos-containing gaskets and packing expressed in Navy documents and the writings of researchers such as Hanies and Selikoff is entirely consistent with my experience as a uniformed and civilian Navy occupational medicine physician.

101. In addition to the documents referenced and discussed above, the development of the Navy's knowledge of asbestos-related health issues and of appropriate workplace practices and controls to prevent exposure to elevated levels of airborne asbestos also is reflected, among others, in the documents listed Exhibit B, which comprise part of the bases for my opinions on these topics.

III. CONCLUSIONS

102. Although my opinions are set forth throughout the entirety of this report, the paragraphs below provide a general summary of my opinions.

103. The Navy made its decisions with respect to the use of asbestos in accordance with Navy operating requirements and in furtherance of Navy missions, and in light of the Navy's knowledge of associated health hazards at the time and of its perception of the requirements of federal law. The Navy's extensive and evolving knowledge of the hazards of exposure to asbestos and the means to control those hazards were weighed by the Navy against the benefits provided by its use. These benefits included meeting national defense needs in a standardized, efficient and low-cost manner that would not delay or hinder ship availabil-

ity, especially during times of war. The Navy was informed in this decision-making by close contacts and liaison with relevant academic communities, professional organizations and other government agencies.

104. Similarly, the Navy's handling of and programs regarding workplace safety and hazard communication, as they related to asbestos and other issues, reflected the Navy's balance of various considerations, including combat readiness, maintenance of the necessary command structure, the needs of discipline and the hierarchy of risks presented by life and work aboard a combat vessel. In general, the Navy chose to address long-term workplace health issues in the course of training for various trades and jobs, rather than using labeling or other written materials to accompany products into the workplace.

105. The Navy's occupational health program in no way depended upon, required or sought advice from equipment manufacturers regarding long-term occupational health issues, including those posed by exposure to asbestos dust. I have not uncovered – nor based on my research and experience and the extent of the Navy's knowledge in these areas would I have expected to – situations in which the Navy solicited from suppliers of shipboard equipment any information or guidance regarding the appropriate methods for the prevention of exposure to asbestos. Given the Navy's state-of-the-art knowledge concerning asbestos related hazards and its robust safety and health program, it would be unreasonable to assume that the Navy would have accepted any advice pertaining to asbestos related safety precautions from a manufacturer of equipment.

106. My opinions set forth herein are held to a reasonable degree of scientific certainty.

DECLARATION OF LAWRENCE STILWELL BETTS, MD, PhD

I have been asked by legal counsel to expand my discussion of several areas which I have previously addressed in trial and deposition testimony, and in prior declarations, affidavits, and reports. To this end, I, Lawrence Stilwell Betts, MD, PhD, CIH, FACOEM, declare that:

1. I retired from the United States Navy as a Captain in 2001, and now have a very active professional practice in science and medicine based in Poquoson, Virginia. As reflected in my Curriculum Vitae (Betts, 2012), I am the President of my own medical and scientific practice. I routinely consult on, or work with, difficult and complex medical cases where treatment, or exposure or possible consequences of exposure, are in question. My professional associations include a wide variety of government, industry, and professional organizations, as well as academically – and privately – practicing professionals. I also teach, mentor, perform research, develop prevention and treatment protocols, and write medical articles and text chapters. I am a Clinical Professor at the Eastern Virginia Medical School where I have had a continuous academic relationship and have been teaching toxicology, previously with the approval of the US Navy while I was on active duty, since 1979. I serve on several national committees addressing broad, as well as specific, issues in occupational and environmental health. I am board certified in both occupational medicine by the American Board of Preventive Medicine, and in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene. Together with the late W. Clark Cooper,

MD, and Mitchel R. Zavon, MD, I am one of the original three "medical scientists" to have ever been elected to Fellowship in both the American College of Occupational and Environmental Medicine and the American Industrial Hygiene Association; a fourth, Sidney Siu, MD, was recently added to this short list of physicians who are also Certified Industrial Hygienists, in 2012. The anticipation, recognition, evaluation, and control of hazardous conditions are the fundamentals of industrial hygiene and my practice of preventive medicine and public health. The emphasis of my entire career has been the prevention of illness and the promotion of health through the application of the professional tools of my scientific and medical knowledge and experience. After my retirement from the US Navy, I was presented the VADM Richard A. Nelson Award for my career contributions to Navy and Marine Corps readiness through leadership in prevention of disease and promotion of health.

2. During my Navy career, I was assigned to billets with professional duties and increasing responsibilities, initially as a scientist in industrial hygiene and toxicology, and later as an occupational and environmental medicine physician and medical toxicologist. I became one of the first physicians to qualify and be designated a Surface Warfare Medical Department Officer (SWMDO). I have spent time at sea on a large number of United States Navy and United States Naval ships and I have worked in and directed occupational health programs at Naval shipyards, air rework facilities, weapons stations, and other major shore facilities in the San Francisco Bay area and the Tidewater area of Virginia. I served as a physician on the USS KITTY HAWK (CV-63) during her extensive

Service Life Extension Program (SLEP) in the Philadelphia Naval Shipyard from 1987 to 1989. Based upon my scientific and medical training, and experience as a Navy officer for three decades, and now as an active governmental consultant for over a decade, I am generally familiar with the industrial products that were used by the Navy and in maritime work environments, both ashore and afloat. I am also familiar with the history and practice of the Navy occupational health program from its early days before World War II until the present time. During the four decades of my professional life, I have also become familiar with, and evaluated occupational exposures to, asbestos-containing and other materials used in the electrical trades, aircraft and aerospace industries, nuclear power facilities, and several other trades and industrial/commercial activities which are not unique to the Navy or maritime industries.

3. Based upon my scientific and medical training, and experience as a US Navy officer for three decades, I am familiar with the Navy mission, the Navy command structure for Navy active duty and civil service personnel, the maritime work environments, both ashore and afloat, and the industrial products and equipment that were used in shipbuilding applications. I am also familiar with the history and practice of the Navy occupational health program from its early days before World War II until the present time.

4. I have been asked by counsel to address the following issues based upon my knowledge, experience, and research, and to report my findings and conclusions:

a. **What are the fundamental missions of the United States Navy (US Navy; Navy) and**

the Navy Medical Department, and how is the Navy organized to fulfill those missions?

b. What role did asbestos (primarily as used in thermal insulation products) play in Navy and maritime shipbuilding and maintenance during the period from before WWII through the enactment and implementation of the Occupational Safety and Health Act (PL-91-596) in the 1970s and thereafter?

c. What did the Navy and other Federal Government Departments and Agencies, private shipyards and employers, as well as organized labor, know regarding the health hazards of asbestos during this time period? Additionally, how did this knowledge affect the use and handling of asbestos during the post-OSHA era?

d. Was there additional occupational health information about asbestos, available during the relevant periods of time, which should have been provided by an equipment manufacturer or vendor supplying a product to the Federal Government in accordance with specifications, or to a private industrial or maritime employer, that would have meaningfully enhanced existing knowledge, and that would have been likely to alter established specifications, policies, and procedures regarding the use of asbestos- containing products and materials?

e. **In fulfilling its mission, did the Navy engage in "risk-balancing" between issues critical to mission success and the risks of asbestos exposure to the health of Navy Department personnel – both active duty and civilian?**

f. **Whether, and to what extent, Navy and shipyard personnel during the 1940s through the 1970s typically were exposed to meaningful amounts of inhalable asbestos dust onboard ships?**

5. I have based my professional opinions contained in this report on my Navy and professional knowledge arising from my training, education, and experience as a scientist, physician, and, now retired, senior United States Navy officer, as well as my extensive research regarding the knowledge of, and response to, asbestos hazards within the Navy and shipyards specifically, and more generally within the scientific and medical communities at large.

MISSION AND ORGANIZATION OF THE US NAVY AND NAVY MEDICAL DEPARTMENT

6. Although the wording of the mission has changed and evolved over time, the Navy currently describes its mission as the following:

> ***"The mission of the Navy is to maintain, train and equip combat-ready Naval forces capable of winning wars, deterring aggression and maintaining freedom of the seas."*** (USN, 2010)

The Navy's mission is carried out as an integral part of the overall strategy of the Department of Defense:

> ***"Current U.S. defense strategy calls for continuing to shape the strategic environment to advance national interests, maintaining the capability to respond to the full spectrum of anticipated current threats, and preparing for the threats of tomorrow. Implementation depends on the fundamentals of military power: quality people, ready forces, and superior organization, doctrine, and technology. The challenge is to construct an effective defense establishment with limited financial resources in accordance with Department of Defense guidance."*** (NAS, 1998)

In order to fulfill its mission, the Navy must be authorized the funds and personnel to develop and maintain resources – the technology, equipment, conditions – to enable its forces. The Navy maintains a ready and capable force in mind, spirit, and equipment so that personnel are able to respond, when called upon, to a variety of events. In addition to actual combat

with a hostile enemy, the Navy must also be able to respond to natural disasters, humanitarian situations, and political events. When not responding to actual combat, the Navy devotes its assets (people, equipment, and funds) to maintaining a state of preparedness and readiness which allows it to be adroit in responding to any mission. Whether at war or in peace, the Navy is always engaged in or preparing for its role in National defense.

7. The ultimate role of the Navy is the projection of force upon the seas as the naval warfare service branch of the armed forces. To this end, the Navy must maintain a constant state of readiness. This is achieved through the maintenance and preparation of ships, aircraft, and equipment, and supporting the shore activities, as well as the personnel manning and operating these activities. The preparation is accomplished through such activities as maintaining and repairing ships, aircraft and other equipment; health promotion and maintenance; equipping and training personnel; developing new technologies – both defensive and offensive; logistics; and budgeting. Without logistics and other support activities, combatant forces (ships, aircraft and personnel) cannot sustain a mission.

8. Even before the United States entered WWII, the Navy Medical Department's express mission was:

> ***"To keep as many men at as many guns as many days as possible."***
>
> (BuMED, 1941)

Currently, this mission statement is not as "combat specific" as manning guns, but still the Navy's Medical Department's primary mission is stated as:

> ***"OUR MISSION IS FORCE HEALTH PROTECTION. As the preeminent maritime medical force deployed with our Navy and Marine Corps warriors throughout the world, we are capable of supporting the full range of operations from combat to humanitarian assistance. We are further capable of providing superior state of the art in-garrison health and preventive care for active duty personnel, our families and those who have worn the cloth of our nation – our retirees."*** (BUMED, 2009)

In support of the Navy's mission, the Medical Department promotes and maintains the health of personnel through the care and treatment of sick and injured members of the Naval service and its civil service employees; prevention and control of diseases and injuries; promotion of physical fitness; as well as performing training and research programs. If people cannot operate the equipment or otherwise perform their duties, ships could not get underway, aircraft could not fly, and other vital operational aspects of the Navy's mission could not be performed in support of national defense.

9. Under civilian leadership (the President, the Secretary of Defense, and the Secretary of the Navy), the Chief of Naval Operations (CNO) is the senior Naval officer with responsibility for every aspect of the overall operations of the Navy. The CNO is a four–star admiral and is responsible to the Secretary of the Navy for the command, utilization of resources, and operating efficiency of the operating forces of the Navy and of the Navy shore activities assigned by the Secretary. As a member of the Joint Chiefs of Staff (JCS),

the CNO is the principal Naval adviser to the President and to the Secretary of the Navy on the conduct of war and is the principal adviser and Naval executive to the Secretary on the conduct of activities of the Department of the Navy. Assistants include the Vice Chief of Naval Operations (VCNO), the Deputy Chiefs of Naval Operations (DCNO), the Assistant Chiefs of Naval Operations (ACNO), and a number of other ranking officers. These officers and their staffs are collectively known as the Office of the Chief of Naval Operations (OPNAV). In addition to the "war fighting members" of the office of CNO, the Navy Surgeon General (SG) and others, such as the Chief of Chaplains and Chief of Information Dominance, also serve to advise the CNO in matters under their cognizance. The SG serves a dual role in the Navy as both the principal advisor to the CNO on medical matters and also the head of the Navy's medical department (Chief, Bureau of Medicine and Surgery (Ch, BUMED)). The CNO may consult with the SG on medical matters; however, the final determination on overall operational strategy and mission achievement rests solely with the CNO (subject to consent of civilian leadership) (USN, 2010).

10. Prior to the 1970s, the Navy's health and safety functions were separately operating components. This initially started in 1917 with the establishment of the safety engineer at shipyards, and then later with the establishment of medical officers at shipyards in the 1920s. The fundamental advisory role of the Navy Medical Department was "medicine" or "health" – not physical safety (such as prevention of trips and falls; "guards" for tool safety). The "Basic Rule of Responsibility" states (CNO, 953):

"Safety is a command function. Responsibility for the safety of personnel is vested in the commanding officer."

The complete text of this rule not only appears in Chapter 1, but is reprinted on the title page of each chapter of the 1953 "United States Navy Safety Precautions".

11. The Naval chain of command is the Service's delineation of "authority, responsibility, and accountability" extending from top Navy civilian leadership (Secretary of the Navy) through all levels of Naval command or "supervision", and to all Navy personnel. From the day of entry into Navy service, all Navy personnel are taught and must strictly adhere to the chain of command. Using the chain of command, all personnel receive their orders (assignments) and supervision from their immediate senior or "supervisor" in the chain of command. This command structure is important to fulfilling the Navy's mission because it (a) defines authority and responsibility from the most senior to the most junior person in the Service; (b) establishes administration, support, communication, and discipline; and (c) organizes forces to carry out operations. The importance of the chain of command to the Navy's mission is demonstrated by the applicable disciplinary actions for Navy personnel who fail to carry out lawful orders from a senior within the chain of command. A significant breach in the chain of command could endanger personnel or equipment, mission completion or success and, ultimately, the national defense.

12. It is ultimately the Commanding Officer's responsibility to ensure that all personnel and equip-

ment, which includes ships, aircraft, and other physical resources, are prepared to operate and perform their functions in support of their assigned mission. The maintenance of good order and discipline is essential to the Commanding Officer's ability to meet his/her responsibilities. If Navy personnel do not follow the military chain of command and perform duties as directed by his/her operational superior, or if civilian "third-parties" are permitted to interfere with the Navy command structure, Navy operations and mission could be endangered. This is simply because the Commanding Officer would not have confidence that his/her orders would be followed and, ultimately, that the Navy's mission objectives would be met.

13. As I discuss more fully below, the Navy established a comprehensive occupational health program that operated within the overall chain of command to communicate medical and hazard information. Whether onboard combatant vessels or in Navy yards or other shore facilities, the Commanding Officer is charged with protecting the health of all Naval personnel and civilian employees (as appropriate) under his/her command. Navy Medical Department officers working under a Commanding Officer have the responsibility for identifying and communicating information regarding occupational health hazards.

HISTORY OF KNOWLEDGE AND CONTROL OF ASBESTOS HEALTH HAZARDS BY THE US NAVY, AND IN US SHIPYARDS

14. With respect to naval and maritime activities, as well as general industry in the United States, the US Navy and the US Public Health Service (USPHS; PHS) have cooperated in evaluating asbestos expo-

sures and developing exposure control methods for almost three-quarters of a century. The US Public Health Service was established by Congress in 1798 as the provider of health services for the US Merchant Marines – initially as the Marine Hospital Service; later the Public Health and Marine Hospital Service; and currently the Public Health Service. At the request of the North Carolina State Board of Health and their Industrial Commission, the US Surgeon General assigned Dr. WC Dreessen and his co-workers from the Public Health Service to perform the first such evaluation of the developing asbestos textile industry in the United States. (Dreessen, 1938). Dr. Dreessen, together with another senior physician in the Public Health Service, Dr. RR Sayers, disseminated these findings at the American Public Health Association meeting in 1938, and later published them in the *American Journal of Public Health* in 1939 for the general scientific and medical communities. Later, at the joint request of the US Navy and the US Maritime Commission, Dr. Dreessen worked with Prof. Philip Drinker and Dr. WF Fleischer, a Navy physician, on an asbestos exposure evaluation and development of asbestos exposure control methods and medical practices for employees at a private US shipyard. (Dreessen and Fleischer, 1944) A discussion of "what and when" the US Navy was aware of regarding the health hazards associated with asbestos and the need to control exposure to airborne asbestos fibers is thus forever intertwined with the "what and when" of the US Public Health Service's parallel awareness and understanding regarding the protection of the health of the general public – and civilian mariners.

15. The Navy's development of nuclear power for ship propulsion systems in the late 1940s led to a close working relationship and the sharing of information between the US Navy and the US Atomic Energy Commission (AEC) – as well as the Public Health Service. The AEC later "evolved" into the Nuclear Regulatory Commission (NRC), the Energy Research and Development Administration (ERDA), the Department of Energy (DOE), and the National Nuclear Security Administration (NNSA). These organizational entities always had a close working relationship with the Navy's Bureau of Ships (BuSHIPS) and the Office of Naval Reactors. A close relationship still exists today between the US Navy and non–Navy ("civilian") Governmental Departments and Agencies through the Navy–Department of Energy Naval Nuclear Propulsion Program. A working relationship also existed between major US Governmental Departments and Agencies and the energy utilities with respect to occupational health and safety. This relationship was enhanced by the presence of two notable individuals: Admiral HG Rickover, USN and HE Stokinger, PhD. ADM Rickover served in joint and overlapping assignments with the US Navy and the early AEC—such as in his roles in the Division of Reactor Development at the AEC and as Director of the Naval Reactors. These roles led to his direct involvement with both the development of the Navy's first nuclear-powered vessel, the submarine USS NAUTILUS which was commissioned in 1954, and also the Shippingport Atomic Power Station which powered up on December 18, 1957 as the first commercial, pressurized water reactor nuclear power plant. Dr. Stokinger served initially in the Industrial Hygiene Section on the Manhattan

Project with the Atomic Energy Commission, and later, in 1951, be became the Chief Toxicologist for the newly created Division of Occupational Health of the US Public Health Service. Dr. Stokinger continued with the Public Health Service until well after the enactment of the Occupational Safety and Health Act in 1970 and the establishment of the National Institute for Occupational Safety and Health (NIOSH). He served on the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) Committee for twenty- five years—fifteen of those years as the Chair. The US Navy had representation in the ACGIH and also on the TLV Committee. As discussed throughout this report, the Navy's knowledge of the applications and hazards of asbestos represented what was available and known by other Federal Departments and Agencies

16. The Navy and the Maritime Commission's use of asbestos onboard ships generally, and on steam systems specifically, was not by chance, nor based on any requirements of the Navy's equipment manufacturers and vendors. The use of asbestos was based upon necessity. Due in large part to the association of one notable individual, Professor Philip Drinker of the Harvard School of Public Health – and who also served as the Chief Health Consultant for the US Maritime Commission, the knowledge and experience possessed by the Navy regarding the use of asbestos since its early use in steam–generating systems, as well as the hazards and means of controlling those hazards, was shared and held by other Federal Departments and Agencies. As discussed in their landmark paper addressing the use of asbestos in the Navy, Fleischer

and coworkers (1946) wrote with the permission of the Navy:

> ***"An important ingredient of pipe covering material used on U.S. Navy vessels is amosite .... The chief reasons for the wide use of amosite felt and pipe covering in naval work are its low thermal conductivity, light weight, strength and refractoriness. When the felt and pipe covering were first developed, we were still building vessels under the Washington Treaty of Limitations in Tonnage, and every pound saved meant that much more armor, guns or ammunition for a given displacement, to say nothing of more economic operation for the weight involved in insulation.***
>
> ***Amosite pipe covering weighs about 14 pounds per cubic foot, with a temperature limit of 750 F, as compared to magnesia with a weight of 16 pounds per cubic foot, and a temperature limit of 500 F, High temperature amosite pipe covering weights about 18 pounds per cubic foot as compared to 26 pounds per cubic foot for other high temperature insulations. Because of the lower conductivity and the higher temperature limit of the amosite type, less of it need be used in combination covering than other types of insulations.***
>
> ***The development of amosite felt started in 1934 when a need existed to secure a thermal insulation lighter in weight and thermally more efficient than the materials (blocks and cement or asbestos blankets)***

which were then being used on destroyer turbines. The Navy approved the type developed by a manufacturer in September, 1934. Originally amosite was used only for turbine insulation, but it proved so satisfactory that its field of application enlarged to include insulation of valves, fittings, flanges, etc. From the initial destroyer, it has been used on almost all the destroyers built since that time and on all other combat vessels built since before the War.

Pipe covering was a later development in late 1935 and early 1936. Due to the manufacturing problems involved, it took a longer time to evolve into a satisfactory shape, and its first use on naval vessels was in 1937. Since that time its use has spread markedly and it was used on the great majority of naval combat vessels built during World War II.

Water-repellent amosite felt was developed during the early part of 1942, as a replacement for hair felt in the insulation of cold water lines to prevent sweating. Hair felt had the disadvantage of being combustible and as it was organic, when it became wet it moulded or rotted and could harbor vermin. At this time fires on board certain naval vessels convinced the Navy of the desirability of eliminating any combustible material from on board ship. Eventually water-repellent amosite was made in strips of 50 foot lengths and of suitable

width to enclose the circumference of the pipe and enclosed in an extremely light-weight muslin to facilitate handling and reduce the dust, which the water-repellent agent accentuated."

17. The US Navy and the US Maritime Administration ("MARAD"; the US Maritime Commission became MARAD under the Department of Commerce in 1950 when its Government-owned shipping interests and operations transferred to this newly-established Administration) specified the types of thermal insulation and lagging for piping and machinery, as noted in the military specifications used for vessels constructed under US Navy and the Maritime Administration contracts for boilers, machinery and piping (MIL-B-18381(SHIPS) (Boilers, Steam, High Pressure Naval Propulsion) and (MIL-STD-769 (Military Standard – Thermal Insulation Requirements for Machinery and Piping)), and for steam propulsion turbines (Mil-T-17600 series (Turbines, Steam, Propulsion)) for vessels built under contract for the US Government. In accordance with these military specifications and the specific contracts that I have seen, external thermal insulation for equipment like boilers and turbines, and the associated appurtenances and piping is provided initially by the shipbuilder, and later upon maintenance or overhaul, the external insulation is provided by the activity performing the work – the Navy or shipyard/repair facility – in accordance with Navy specifications. The composition and thickness of external thermal insulation, if required by Navy specifications for a specific thermal application of a valve or fitting, are provided in the "General Specifications for Machinery of Vessels of

the United States Navy" (Section S39-2; 1951; later Chapter 39 Bureau of Ships Technical Manual of 15 April 1959 and Chapter 9390 of the same Manual dated 5 Jan 1965) (BUSHIPS, 1951; 1959; 1965). The General Specification, dated 8 December 1951, specifically addresses the type and thickness of external thermal insulation (block, felt, and blanket) applied to turbines and other equipment and serves as the basic reference for ship design, building, and repairing activities. It would also be the basic reference cited in an equipment manual. Starting in the mid–to–late 1960s, the Navy specifications for the composition of thermal insulation materials changed – some asbestos-containing thermal insulation materials were no longer used, while the asbestos content of others was reduced. (Turnbull, 1969; OiC NAVSEC, Philly, 1969; COMNAVSEC, 1971; COMNAVSHIPSYSCOM, 1971; COMNAVSEC, 1972; COMNAVSEASYSCOM, 1975) During this period of time, additional Federal, as well as Navy, safety and health requirements were enacted to control the exposure to airborne asbestos fibers and meet Federal pollution control statutes.

In addition to thermal insulation, the US Navy also specified the types and styles of materials which were used for packing and gasket applications, as well as the types and applications of electrical products used on vessels of the US Navy. The packing and gasket specifications, and their unique Navy symbols which are used to identify and order approved products for specific applications, are given in the "Standard Plan Application of Packings and Gaskets" (Bureau of Ships, Navy Department, 1945), and are discussed in Chapter 95 of the "Bureau of Ships Technical Manual (NAVSHIPS 250-000; Chapter 95; 1959). Packings

and gaskets were specifically required by paragraph 95.3: "PROPRIETARY BRANDS, AVOID REFERENCE TO" and reads:

> ***"Packing and gaskets shall be ordered by Navy symbol number or applicable specification, and not by brand name."***

The use of non-friable asbestos-containing materials in gaskets, packings, wire and cable, as well as in other Navy electrical system applications where the asbestos was "embedded" and not friable, did not present an "inhalation exposure hazard" to asbestos fibers under normal conditions of handling and use. This determination was based upon data and professional opinions dating back to World War II, and reconfirmed through the work of more current investigators. (Liukonen et al., 1978; Mowat et al., 2005; Williams et al., 2007)

The Occupational Health and Safety Administration (OSHA) and the US Environmental Protection Agency (EPA) interpret the term "friable". Under OSHA, "friable" is defined as:

> ***"C. The potential for an asbestos-containing product to release breathable fibers depends largely on its degree of friability. Friable means that the material can be crumbled with hand pressure and is therefore likely to emit fibers. The fibrous fluffy sprayed-on materials used for fireproofing, insulation, or sound proofing are considered to be friable, and they readily release airborne fibers if disturbed. Materials such as vinyl-asbestos floor tile or roofing felt are considered non-friable if intact***

> ***and generally do not emit airborne fibers unless subjected to sanding, sawing and other aggressive operations. Asbestos-cement pipe or sheet can emit airborne fibers if the materials are cut or sawed, or if they are broken."***

A similar definition is used by the EPA under the "National Emission Standards for Hazardous Air Pollutants" (NESHAP) regulations initially published in 1973:

> ***"Friable asbestos-containing material (ACM), is defined by the Asbestos NESHAP, as any material containing more than one percent (1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy (PLM), that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure." (Sec. 61.141)*** [EMPHASIS ADDED]

When the health standard for asbestos enacted under the Occupational Safety and Health Act of 1970 was published separately as the "Asbestos Standard" in 1972, the requirements for labeling or a warning notification did not apply to all asbestos-containing products – it excluded non-friable asbestos-containing materials such as these (DoL, 1972):

> ***"(2) Caution labels—(i) Labeling. Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been***

> ***modified by a bonding agent, coating, binder, or other materials so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne asbestos concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section will be released."*** [EMPHASIS ADDED]

Section (b) of this 1972 Standard reads:

> ***"(b) Permissible exposure to airborne concentrations of asbestos fibers— (1) Standard effective July 7, 1972. The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed five fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section."*** [EMPHASIS ADDED]

As defined under OSHA and the EPA, it is not the mere presence of asbestos in a material – it is the so–called "asbestos-containing material" or "ACM" which is regulated by the material's asbestos content (greater than 1%) and potential to release airborne asbestos fibers (greater than 5 microns in length) in excess of the asbestos PEL. The representation and claim that an individual was "exposed to asbestos" based solely upon a material's composition is non-sensical in terms of scientific or probabilistic reality - and under reasonable thinking.

18. The United States Navy recognized that the inhalation of asbestos fibers in sufficient amounts

(dose = concentration x time) could result in pulmonary disease since at least the early 1920s and had an active program to identify hazardous exposures and to prevent exposures leading to recognized health effects. In the "Instructions to Medical Officers (Notes on Preventive Medicine for Medical Officers, United States Navy)", asbestos was listed as one of the many inorganic and organic dusts that could cause pulmonary disease. (Dublin, 1922) Dublin also recognized several methods to prevent the inhalation of these dusts including: the use of water to control the release of dust; the use of local exhaust systems to remove the dust at the point of origin; the use of inclosing (sic) chambers; and the use of respirators and helmets. He stated: ***"No one of these can apply to all conditions, but the particular method to be used must be adapted to the peculiarities of the process."*** From the extensive list of inorganic, as well as organic, dusts and ***"occupations which offer such exposure"***, it is obvious that his perception of dust control was based upon the avoidance of recognizable disease, and not the mere presence of a given, or visible, amount of dust being generated.

19. The United States Navy expanded the scope of its asbestos hazard control program by including the enlisted corpsmen of the medical department in the hazard control process. In the "Handbook of the Hospital Corps" (United States Navy, 1939), the Bureau of Medicine and Surgery discussed the organization used for disease and injury prevention in the United States Navy, and took a lead position in the prevention of industrial diseases:

> ***"The government having passed such laws must therefore lead the way in protecting***

its own employees.... An organization has been set up in the Navy to protect its personnel, both civilian and naval, a safety engineer is provided, who acts directly under the Assistant Secretary of the Navy. He has supervision of the safety precautions taken to protect the civilian employees in the navy yards, ammunition depots, torpedo stations, and the like. He is also a consultant in all matters pertaining to safety aboard ships, at training stations and other Navy Department activities. A naval medical officer is assigned to his office for the purpose of consultation in all matters pertaining to health and safety and to cooperate in devising means by which health may be protected and accidents prevented. Aside from this particular medical officer, all medical officers, dental officers, members of the Hospital Corps and nurses form the balance of the medical staff of this organization. It is essential that each of these members know and understand the hazards to be encountered in the Navy, the steps to be taken to protect against injury and disease, the treatment of diseases and injuries arising therefrom and the organization of medical personnel for such purposes. Naval medical personnel are required to perform duties ashore, at sea, in foreign countries, in the air and under the sea. In each of these places a variety of health hazards exist. It is therefore necessary that these personnel

have a thorough knowledge of the industry to which they are attached, the hazards presented, the methods of prevention and the treatment of all injuries occurring.

In all navy yards, the Commandant is the head of the organization. He is responsible to the Navy Department for the protection of the employees, as well as the naval personnel, under his command. He is familiar with the nature of the work being performed by the employees at his station and on the health and accident hazards presented. Accordingly, he appoints, as the working head of the organization, a safety officer or a safety engineer, as he is better known. The safety engineer must be of sufficient rank to have become familiar with the various trades in a navy yard, a knowledge of machinery, a man of cooperative ability and well liked, and having sufficient knowledge of safety devices and appliances to intelligently make inspections and recommend proper protective measures. His duties are primarily, to prevent accidents and promote healthy working conditions. It is his duty to inspect all working places, make a general survey of all mechanical conditions and to recommend the addition of all necessary safety appliances for the protection of the workers.

The Commandant further assigns a medical officer to act as advisor to the safety engineer. The medical officer must be of

the same qualifications as the safety engineer, with the addition that he must be thoroughly versed in the diseases connected with Industry . . . It is well for members of the Hospital Corps to understand the nature of these duties in order that they may be of assistance to him in the performance of these duties: . . . He acts as consultant to the safety engineer in all matters pertaining to the general welfare and health of the employees. Hygiene and sanitation are his important duties. He must interest himself in the employees and instruct them in the everyday principles of personal hygiene and self preservation. He must instruct the employees in safety measures and encourage them to cooperate in protective measures. They must be made "safety conscious" or "safety minded". The morale must be kept up....

The medical officer must inspect all working places in order to have a better understanding as to the actual conditions under which the men work. He must make appropriate recommendations to improve deficiencies noted and must then see that these recommendations are carried out."

The text further notes that the safety engineer is assisted by other personnel:

"The safety engineer is assisted in his work by the foremen of the shops and in some instances by safety committees in each shop elected by the employees. These men or committees are generally chosen from

> ***among the older employees and from men who have considerable experience in their trade . . . The organization of the medical advisor is composed of junior medical officers, dental officers, to some extent, members of the Hospital Corps, and of nurses. The duties of the hospital corpsmen are to assist the medical officer in his inspections, assist in the treatment of the injured and to prepare the necessary reports and returns in cases of accident, occupational disease, and the physical examination of employees."***

A similar organization is described for ***"... a battleship or in other places."***

To this end, the enlisted Hospital Corpsmen were informed of the hazards presented by asbestos and instructed to ***". . . locate these hazards and afford protection accordingly."*** Two of the hazards that the Hospital Corpsmen were specifically instructed to evaluate in a questionnaire (inspection or survey form) were:

> ***"What precautions are exercised to prevent damage from pipe covering compounds?"***
>
> ***"What asbestos hazards exist?"***

Also, the Hospital Corpsman was instructed to help keep the workforce healthy:

> ***"Proper working places must be provided and maintained. Hygienic and sanitary conditions must be kept on a high plane. All moving parts of machinery must be***

guarded, goggles provided for workers required to use them; helmets and masks for sand blasters; proper ventilation for the chrome workers; masks for asbestos workers; protection for workers in x-ray and radium; protective gloves, shoes, and other garments for foundry workers, and other means of protection too numerous to mention here must be available and used. Special physical examinations must be made of all sand blasters, asbestos handlers, those exposed to radium and its compounds, lead workers, those engaged in dusty or smoky trades, handlers of T.N.T. and other explosives, etc., to prevent the occurrence of the diseases associated with those trades from injuring the men."

20. This type of active assessment, evaluation, and recommendation for control was embraced by senior United States Navy officers. In his memorandum to the Manager of the Navy Yard, Boston, Captain HE Jenkins, MC, USN (Jenkins, 1939) discussed his findings and recommendations from his survey of the pipe covering shop and work shack at that yard. Although he stated that the health hazards to personnel were very remote, based upon his evaluation of the amount of dust released, Captain Jenkins recommended that a dust respirator and gloves be worn to supplement the ***"conscientiously and intelligently enforced"*** practice of wetting down insulating material. Captain Jenkins also addressed the impractical use of respirators during shipboard lagging operations and recommended sufficient wetting to prevent dust generation as far as practicable. Less than one week later, CDR

CD Headlee, USN (1939), issued a "Production Division Notice (Number 996)" implementing these recommendations. Captain EW Brown, MC, USN (1941), in the "Annual Report of the Surgeon General, US Navy to the Secretary of the Navy" and in the scientific publication of his presentation made to the Fifth Annual Meeting of the Air Hygiene Foundation of America (1941), discussed the findings of his medical survey at the New York Navy Yard. Captain Brown, recognized as the founder of the Navy's formal occupational health program, assessed asbestos exposure and medical findings of eleven workers at the New York yard. With knowledge of occupational exposure to silica and its delayed clinical findings, and under the conditions that he observed, Captain Brown found no indication of pulmonary disease in these workers at that time. He noted that wet methods and local exhaust ventilation were implemented, and that the workers wore a respirator ***"during the dustiest aspect of the process."*** He stated that similar findings were reported in two other yards and recommended that the study be extended to all men in this trade. These references further demonstrate that senior Navy personnel actively monitored and controlled the Navy policy regarding disease and injury prevention, and were indeed the leaders in field assessment and control of occupational health hazards, including asbestos.

21. When quantitative assessment (counting) of asbestos particles in air was available, the Navy followed the recommendations of the United States Public Health Service. Based upon the findings of Dreessen and coworkers' (1938) study of asbestosis in the textile industry prepared by direction of the United States Surgeon General, the United States

Navy accepted an exposure level of 5 million particles per cubic foot (5 MPPCF) as the time-weighted average (TWA) for occupational exposure. Dreessen and coworkers concluded:

> ***"It would seem that if the dust concentration in asbestos factories was kept below 5 million particles (the engineering section of this report has shown how this may be accomplished), new cases of asbestosis would probably not appear."***

This TWA is the average airborne concentration of asbestos particles to which an individual could be exposed in an eight hour period. Shorter periods of higher concentrations were acceptable as long as the average exposure calculated over eight hours did not exceed the TWA.

22. As Navy Medical Department personnel, when Captains Jenkins and Brown encountered asbestos exposure conditions that were not fully satisfactory and required changes, they made recommendations for correction of the exposure conditions to higher line (command) authorities. In both of these instances, only a qualitative assessment was made and actual exposure levels were not determined. Captain Brown (1941) performed a further medical assessment and found no significant clinical findings in the limited number of workers observed during the relatively short, post-exposure period. The Navy's occupational health program was based upon internal support for the identification and control of occupational health hazards. In order to develop a sufficient cadre of physicians and scientists, the Navy developed training programs with Columbia University's Delamar Institute of Public Health and the Harvard

School of Public Health. By the end of World War II, over one hundred physicians, scientists, and engineers had been trained in occupational health at these two leading institutions of US public health.

23. In 1936, the United States Congress recognized that it was in the national interest to build and maintain a strong merchant marine fleet and passed the Merchant Marine Act in 1936 (US Congress, 1936) in order:

> ***"To further the development and maintenance of an adequate and well-balanced American merchant marine, to promote the commerce of the United States, to aid in the national defense..."***

To this end, Title 1: Declaration of Policy; Section 101 of this Act establishes the policy of the US Government in maritime matters:

> ***"It is necessary for the national defense and development of its foreign and domestic commerce that the United States shall have a merchant marine***
>
> ***(a) sufficient to carry its domestic water-borne commerce and a substantial portion of the water-borne export and import foreign commerce of the United States and to provide shipping service on all routes essential for maintaining the flow of such domestic and foreign water-borne commerce at all times***
>
> ***(b) capable of serving as a naval and military auxiliary in time of war or national emergency,***

(c) owned and operated under the United States flag by citizens of the United States insofar as may be practicable, and

(d) composed of the best-equipped, safest, and most suitable types of vessels, constructed in the United States and manned with a trained and efficient citizen personnel. It is hereby declared to be the policy of the United States to foster the development and encourage the maintenance of such a merchant marine." [EMPHASIS ADDED]

24. The "Minimum Requirements for Safety and Health in Contract Shipyards" ("Minimum Requirements") were drafted in 1942 by representatives from labor management committees, labor unions, management of private shipyards, insurance companies, the United States Maritime Commission, and the United States Navy. When approved by the US Navy and the US Maritime Commission in early 1943, compliance with these standards was expected in shipyards:

"Each contractor is hereby given notice that the Navy Department and the Maritime Commission will expect full and complete compliance with the minimum standards which bear the approval of the Navy Department and Maritime Commission, and each is requested to give full cooperation to the consultants on health and safety who will be charged with the coordination and supervision of the safety and health program of the two agencies.

H-13. A Guide for Prevention of Industrial Disease in Shipyards

13.1 Eight common types of disease and methods for their prevention are given in the following sections. Help in applying these methods will be given by the local Safety Department and by safety and medical consultants of the Navy Department and the Maritime Commission.

* * * * *

13.7 Asbestosis

a. Sources: In general, any job in which asbestos dust is breathed. For example:

1) Job:	***2) When Material Is:***
3) Handling	***4) Asbestos***
5) Sawing	***6) Asbestos mixtures***
7) Cutting	***8)***
9) Molding	***10)***
11) Welding rod salvage	***13)***
12)	

b. Job can be done safely with:

1. ***Segregation of dusty work and,***
2. ***(a) Special ventilation: hoods enclosing the working process and having linear air velocities at all openings of 100 feet per minute, or***

   (b) Wearing of special respirators
3. ***Periodic medical examination"***

25. Less than six months after these "Minimum Requirements" were issued, the Secretary of the Navy (Forrestal, 1943) reaffirmed these requirements for all private shipyards having Navy contracts. Although the "Minimum Requirements" did not provide a specific occupational exposure value for asbestos, they gave general requirements for safe (healthful) shipyard operations. The Navy's occupational health team was responsible for assisting in interpreting the standards for implementation at Navy and contract yards throughout the country. Any significant inspection findings, whether favorable or adverse, were to be discussed first with the shipyard management, thus allowing management the opportunity to take corrective action for imminent dangers. The actual written report was to be submitted in draft form to the regional director of the Maritime Commission for final typing. Until the enactment of OSHA, these early nationally recognized safety and health standards initiated under the "Minimum Requirements" continued in effect at private US shipyards through the updated requirements of the Walsh–Healey Public Contracts Ad. (US Cong, 1936) and the "Safety and Health Regulations for Ship Repairing" (DoL, 1960).

26. In addressing exposure to asbestos, Philip Drinker, then Chief Health Consultant for the United States Maritime Commission, and Professor in the Harvard School of Public Health program that was training the Navy physicians, scientists, and engineers, recommended an occupational exposure level of 5 MPPCF (Drinker, 1944). This is the same value as recommended by Dreessen and coworkers of the US Public Health Service (1938) to prevent the development of disease. The shared and jointly-held

knowledge among various Federal Departments and Agencies regarding asbestos health hazards, as well as the need and methods to control these hazards were well-established.

27. In January, 1945, Philip Drinker (1945) informed Captain TJ Carter, MC, USN, Bureau of Medicine and Surgery, of a potentially serious health risk from asbestos dust exposure at the Bath Iron Works. He was concerned that similar risks might be found in other yards where the same type of pipe covering was used. In this letter, Professor Drinker stated that the manufacturers of the asbestos insulation materials used at Bath would:

> ***". . . be glad to get out a brief statement of precautions which should be taken in light of their own experience and that they would inform their competitors that I had asked them to do so. I understand that neither the Navy nor Maritime wants any change in the specifications as the performance with the present materials is entirely satisfactory. From a health standpoint we do not believe any specification changes are needed."***

Drinker recommended that a study be performed to evaluate asbestos exposure and disease among workers, and stated that ***"Admiral Mills agreed that such studies would be wise before Navy or Maritime accepted this asbestosis risk as being significant in our general ship construction program."*** Four shipyards in the Northeast, two contract yards (New York Shipbuilding in Camden, NJ and Bethlehem Steel Fore River in Quincy, MA) and two US

Navy yards (Boston NSY and Brooklyn NSY), were selected for this study of exposure levels and health status; additional dust exposure data were provided by the Portsmouth Naval Shipyard. The study, conducted by Fleischer, Viles, Gade, and Drinker–also called the "Fleischer-Drinker study" – was promptly undertaken and reported in September, 1945 (Fleischer et al., 1946). The results of this study reaffirmed the Navy's position on adherence to an occupational exposure level of 5 MPPCF. The conclusions were:

> ***"1. The character of asbestos pipe covering on board naval vessels is such that conclusions drawn from other asbestos industries such as textiles, cannot be applied.***
>
> ***2. The operations of band saw cutting, grinding, cement mixing, and installation aboard ship should be equipped with exhaust ventilation to keep the total dust concentration low.***
>
> ***3. The incidence of asbestosis among pipe coverers in the shipyards studied was low, 0.29 per cent or 3 cases out of 1074.***
>
> ***4. Since each of the 3 cases of asbestosis had worked at asbestos pipe covering in shipyards for more than 20 years, it may be concluded that such pipe covering is not a dangerous trade."***

The results of this well-designed study, measuring actual asbestos exposure values and performing health assessments on the exposed workers, became established as Navy policy. The Navy adopted a recommended "maximum allowable concentration (M.A.C.)"

value for asbestos of 5 MPPCF. This was the same value discussed by Dreessen and coworkers (1938) when assessing the asbestos textile industry with much longer daily exposure periods and primarily the chrysotile type of asbestos. It is also the value recommended by the National Conference of Governmental Industrial Hygienists in 1942, and later adopted by the American Conference of Governmental Industrial Hygienists (ACGIH) in 1946. Among the members of the ACGIH in 1946, a private professional organization which did not offer membership to individuals affiliated with industry, were three representatives of the Navy Department and forty-two representatives from the United States Public Health Service. At this point in time, Professor Drinker was an associate member of the ACGIH representing one of the educational institutions – Harvard University. Since there were no federal, state, or local occupational exposure standards, the Navy used the occupational exposure level that the best scientific and medical evidence supported. In 1955, the Navy adopted the "Threshold limit values for toxic materials" developed by the American Conference of Governmental Industrial Hygienists as a basic reference and ***"to provide guidance toward the reduction of potential health hazards encountered in the industrial environment for both military and naval civilian personnel."*** The Navy (BUMED, 1955) recognized that:

> ***"[The] threshold limit values should be used as a guide in the control of health hazards and should not be regarded as fine lines between safe and dangerous combinations. The most desirable levels in all cases are those approaching zero, but***

> ***practical considerations frequently require the acceptance of higher levels which are safe, but not ideal."***

Moreover, the Navy recognized that:

> ***"[The] threshold limit values . . . are based on the best available toxicological information, long-term industrial experience, and experimental studies. In as much as these values are constantly being reevaluated, revisions or additional will be made as further information becomes available."***

28. The "Bureau of Ships Technical Manual, Chapter 51: Boilers (BuSHIPS, 1955)" addresses the engineering and operating aspects of boilers and establishes Navy policy in these areas. Although this official publication does not address all medical aspects of the Navy's occupational health program, in Section 51-43, it specifically states precautions for work inside the furnace of a steam generator under "Examination and Cleaning of Firesides":

> ***"The use of a respiratory mask for toxic dust during cleaning operations is required to prevent any toxic effect of the dust on personnel."***

This brief note of requirement did not discuss the various components of the toxic dust – nor all aspects of the Navy's occupational health program discussed above. From the industrial hygiene perspective at the time, the primary dusts of concern in the furnace of a Naval steam generator were crystalline free silica and carbon/carboniferous residue from the incomplete combustion of fuel; other less significant particulates

included metallic oxides, asbestos, and asbestos decomposition products. The requirements for a Navy gas-free engineer to assess and authorize controlled entry with appropriate safety equipment into a closed space, such as tanks, voids, and "cold" boilers, is contained in The "United States Navy Safety Precautions, OPNAV 34P1" (CNO, 1953).

29. The Commander, Long Beach Naval Shipyard, and his management, production, and medical staffs, including the Industrial Hygiene Department, were exemplary in controlling occupational exposures through direct involvement and coordination with civilian shipyard workers, organized labor officials, and the Commanding Officers and crews onboard ships undergoing maintenance and repair. In May 1947, CAPT TP Wynkoop, USN, the Shipyard Commander, wrote an open memorandum for "Commanding Officers of Ships" regarding "Safety practices of fleet personnel at this Shipyard" (Wynkoop, 1947). This Memorandum was later published in the Navy-wide publication: "Safety Review" in July, 1947, and states:

> ***"In accordance with instructions, issued by the Bureau of Ships and the Office of Industrial Relations in the Secretary's Office, it is requested that commanding officers of ships in the shipyard take steps to insure that military personnel aboard their ships conform to Shipyard safety practices when performing work within the Shipyard. The Safety of naval personnel is no less important than that of civilian personnel."***

To this end, CAPT Wynkoop established a liaison between each ship's force via an appointed safety officer

and the Yard Safety personnel; provided for a visit by a Yard Safety inspector upon arrival in the Yard to deliver and discuss pertinent safety orders; provided for additional consultation and advice via the Yard's Safety Superintendent; and made the loan of safety equipment, including respiratory protection, available to ships. He additionally wrote:

> ***"Commanding officers are urged to make full use of available safety equipment and technical advice in performing ships force work to the end that accidents to naval personnel may be minimized, if not eliminated within the shipyard."***

The level of occupational safety and health leadership and involvement demonstrated by this Shipyard continued with many highpoints. Mr. OW Meeker (Master, Shop 56, Long Beach Naval Shipyard) told the assembled representatives of the major Navy shipbuilding and repair facilities at the First Shop 56 Masters' Conference of Pipe and Copper Shop Master Mechanics' Conference held at the Boston Naval Shipyard in May, 1957 (Meeker, 1957), that he, even as a non-medical professional, recognized the potential hazard of prolonged inhalation of significant concentrations of airborne asbestos fibers:

> ***"The most apparent symptom of asbestosis is lethargy or a lack of vitality. What we suspect to be lead in the posterior might well be asbestos in the lungs.***
>
> ***. . . Remove the cause by substituting other products such as Armaflex and StaFoam for asbestos whenever possible. However, this will take some doing.***

> ***In the meantime, the answer is wearing of respirators by all who handle asbestos products. To many the very idea of wearing respirator (sic) is repugnant. However, a respirator on the face is preferable to asbestos in the lungs. Therefore, gentlemen, ours definitely is the important and difficult task of providing and installing effective insulating materials aboard Naval Vessels. Moreover, this task must be accomplished without sacrificing our workmen in the process."***

A Navy study of pipecoverers performed by the Industrial Hygienist at this same shipyard and reported in January, 1959 (Anon, 1959), concluded:

> ***"The work habits, personnel protection and working environment of these men are not of desirable standards. These conditions, plus their increasing years of exposure and the medical study, indicates the need for corrective action."***

In order to achieve compliance with existing Navy occupational health policy, the Secretary for the Asbestos Union at Long Beach Naval Shipyard (Local #20), Mr. Webster Ay, was kept involved with asbestos program developments throughout this period of time. In an April 1957, letter from the Yard Industrial Hygienist, Mr. JR Sheehan, Mr. Ay was informed about medical developments to maintain and improve the health of workers in the "dusty trades", and his cooperation was sought (Sheehan, 1957). The use of ventilation and respiratory protection was encouraged for his members. As a demonstration of this cooperation between management and workers, Mr. Ay co-developed

the nationally-circulated "Grim Reaper" poster with Mr. CV Krieger, the Shipyard Safety Superintendent (Sickles, 1961):

"Is your FUTURE . . . With Him (the Grim Reaper) . . . Or Them (your Family)? WEAR YOUR RESPIRATOR"

Later, the civilian Navy industrial hygienist at Long Beach Naval Shipyard, Mr. WT Marr, further wrote on the hazards of, and controls for, asbestos insulation work by shipyard insulators onboard ships. (Robbins and Marr, 1962; Marr, 1964) This cooperation between management and labor in promoting worker safety and health reflects the level of involvement between the unionized asbestos workers (Association of Heat and Frost Insulators and Asbestos Workers) who were affiliates of the American Federation of Labor-Congress of International Organizations (AFL-CIO) and the US Government. During this period, the AFL-CIO developed a close relationship with Irving J. Selikoff, MD for the assessment and control of occupational illnesses arising from exposure to asbestos by members of this organization.

30. The recognition of the potential hazard created by exposure to significant concentrations of airborne asbestos fibers was also evident at the Boston Naval Shipyard since the late 1930s. As mentioned above, there is documentation that the senior Navy Medical Department representative at the Boston Naval Shipyard (CAPT HE Jenkins, MC, USN) performed site evaluations to assess inhalation of airborne asbestos fibers as far back as 1939. (Jenkins, 1939) Captain Jenkins noted the use of the ***"conscientiously and intelligently enforced"*** practice of wetting down insulating material in the production

shop. He recommended that this practice be extended to shipboard operations in order to prevent dust generation as far as practicable as the use of respirators was impractical in such settings. The shipyard management agreed and promptly issued a Production Notice which made these medical recommendations mandatory. (Headlee, 1939) As noted above, the Boston Naval Shipyard was one of the two Navy yards surveyed in the Fleischer-Drinker Study published in 1946. The results of this study supported the Navy's program for asbestos control which was aimed at controlling release of asbestos fibers to levels below which were deemed to be hazardous – that is, below 5 MPPCF. The Boston yard continued its contributing role to the Navy's asbestos control program by hosting the "Pipe and Copper Shop Master Mechanics' Conference" at the Boston Naval Shipyard in 1957. Mr. George P. Chamberlain, Master Pipefitter and Coppersmith (Shop 56) at the Boston Yard, served as the Conference Chairman. In his "Travel Report" submitted by Mr. EB Stecher from the Navy Bureau of Ships (Stecher, 1957), Mr. Stecher reflected upon some of the comments made by Meeker, but he felt that compelling workers to wear respirators had been unsuccessful in the past, and that material substitution was the only method which offered complete resolution of the health hazard from asbestos:

> ***"Considerable discussion took place regarding asbestosis (silicosis). This is still an acute problem in many of our Yards. It was pointed out that regardless of the instructions, the insulation men will not wear masks especially when installing insulation aboard ships. The only solution***

appears to be to find an insulation that is not a health hazard."

However, in his statement regarding his idea for resolution of the asbestos inhalation hazard, Mr. Stecher failed to consider the obvious necessity of dealing with the problem at hand – namely, the asbestos-containing materials which were used extensively onboard Navy ships of the era and work which needed to be currently accomplished while providing adequate protection for workers. Meeker also sought suitable replacement materials, but made that consideration when he said:

"In the meantime, the answer is wearing of respirators by all who handle asbestos products. To many the very idea of wearing respirator (sic) is repugnant. However, a respirator on the face is preferable to asbestos in the lungs."

Mr. Ernani Storlazzi, CIH (Retired) in his Declaration dated October 8, 2008, testified that he was initially assigned to the Boston Yard as an active duty Navy officer and that he then continued as a civil service industrial hygienist from 1946 until the Boston Naval Shipyard closed in 1974. During that period dating back to the mid-1940s, he states that information regarding the potential hazards of asbestos and the proper means of control were available to workers in the Boston yard:

"During my entire tenure at the Boston Naval Shipyard, I was mindful of potential asbestos dust hazards. The standard operating practice at the Boston Naval Shipyard was to survey various shops and ships

under repair, including the pipecovering shop, on an intermittent basis. Whenever such surveys revealed potential hazards, the workers and/or their superiors would be advised as to appropriate precautions to take. This included routinely instructing the workers in the pipecovering shop that they should take precautions regarding heavy asbestos dust exposures. This included instructing the workers to utilize respirators, to implement local exhaust procedures and/or to use wet down techniques. In short, the state of the art precautions of the time were communicated to the workers and management in the Boston Naval Shipyard."

He further adds that such information and programs were widely disseminated throughout the US Naval establishment:

"From my own observations at the Boston Naval Shipyard and from information regarding other shipyards across the country, knowledge regarding the potential hazards of asbestos exposure were well-known throughout the shipyard work force. Undoubtedly, anyone engaged as a pipecoverer should have been well aware of such information, and tradesmen in other occupations had every opportunity to gain similar knowledge. Starting in the earliest years, some of the workers were utilizing respirators. Additionally, starting in the earliest years, some operations would be segregated and marked off to

keep uninvolved workers away from the potential exposures. By the late 1960s, the vast majority of insulation workers were utilizing dust masks on at least a part time basis. Information regarding asbestos hazards was readily available to anyone in the shipyards. Additionally, over the years, this information had been communicated throughout the Naval community at various levels. I have no doubt that many, many officers and men in the United States Navy were fully informed regarding asbestos dust hazards from the earliest 1940s to all times thereafter.

During my entire time with the Navy, both as a uniformed officer and subsequently as a civilian employee, I believe that I was well informed and well educated regarding my professional field of industrial hygiene. At all times, I felt that I was properly informed regarding the state of the art pertaining to asbestos dust and its potential hazards. Likewise, I believe my colleagues in the Navy, across the country, were similarly well informed."

Mr. Storlazzi's Declaration is supported by the Memorandum from Mr. GP Chamberlain dated 1 October 1962. Mr. Chamberlain (the Pipe and Copper Shop Conference Chairman in 1957, noted previously) states that the purpose of this Memorandum addressing "Respiratory Protection for Pipecoverers" is:

> ***"To disseminate instructions concerning the safety requirements which are mandatory for all personnel working with asbestos insulating material."***

Mr. Chamberlain notes that asbestos dust counts were obtained during routine practices in the shop and onboard ships during the period of May to June, 1962. The results of these surveys prompted him to re-direct pipecoverer supervisors to again emphasize asbestos control procedures and ensure specified types of respiratory protection for dusts were assigned to pipecoverers onboard ship and that they were worn when asbestos-containing materials were being handled and a hazardous level of respirable dust was generated. He further directs that:

> ***"e. Care shall be exercised to control the formation of dust at all times. Old insulation material shall be placed in suitable containers as it is removed and not dropped or left lying on the ... [ILLEGIBLE] . . . shall be removed to a weather deck promptly.***
>
> ***f. Following insulation removal work, the deck shall be cleaned of all accumulated dust to prevent further contamination of the work area.***
>
> ***g. Where a large quantity of asbestos insulation is to be removed within a confined space, arrangements shall be made to assure that adequate exhaust ventilation is provided . . .***

4. Compliance with the safety requirements herein described is mandatory on the part of all personnel concerned."

Mr. Meeker, Mr. Chamberlain, and Mr. Storlazzi each realized that constant oversight and periodic reemphasizing of the asbestos handling and control requirements were essential when the potential for a hazardous level of respirable asbestos dust was present under shipyard working conditions. Finally, in 1969, the Navy determined that the only practical method of controlling exposure to hazardous levels of asbestos dust throughout the Navy was to make a concerted and directed effort to use substitute thermal insulation products manufactured either without asbestos, or using insulation materials with a lower content of asbestos and noted:

"Since individual habits of workman play a large role in their exposure patterns, observations of their practices have been included in this survey. Most insulation workers are aware that exposure to asbestos dust, even in low concentrations, is hazardous but they also feel that the hazards are unavoidable and must be accepted as part of the occupation. Moreover, a recently published survey conducted by a naval shipyard aboard selected ships has revealed that, although dust respirators have been required during installation and ripout of asbestos, 76% of the workers did not use them. In fact 50% did not possess respirators even though they were readily available in central tool rooms.

This lack of worker discipline and the seriousness of the lung effects of asbestos could be the main deciding factors for considering the elimination of asbestos as a lagging material and as a cement on piping, ducts, and boilers and thus reduce and eradicate the reported incidence of asbestosis ranging from up to 21% among shipyard insulation workers."

31. An early example of the many safety handbooks issued by the Navy as aids in safety indoctrination and accident prevention is the Bureau of Ordnance's "Safety Handbook for Pipefitters" issued on January 7, 1958. This handbook provides, in part:

"Asbestos. Asbestos dust is injurious if inhaled. Wear an approved dust respirator for protection against this hazard."

32. In 1959, the Navy, the Coast Guard, the Maritime Administration, and maritime industrial employers, as well as trade associations and labor organizations, were involved in the development of the standards which led to the "Safety and Health Regulations for Ship Repairing" (DoL, 1960). These Regulation were mandatory for all maritime repair and construction activities:

". . . safety and health regulations that have been determined by the Secretary of Labor to be reasonably necessary to protect the life, health and safety of employees engaged in longshoring, ship repairing, and related employments covered by Section 41 of the Longshoremen's and Harbor Workers' Compensation Act, as amended.

. . .

These regulations are mandatory with respect to employers subject to the Act, and affected persons should familiarize themselves with the contents of this publication. In this connection, Bureau personnel concerned with the administration of these regulations will extend all possible assistance."

In these regulations, the Department of Labor (DoL) also adopted the occupational exposure level of 5 MPPCF for asbestos and required the use of respiratory protection at private longshoring, ship repairing, and related employments when indicated:

"Protection against particulate contaminants not immediately dangerous to life. (1) When employees are exposed to unsafe concentrations of particulate contaminants, such as dusts and fumes, mists and fogs or combinations of liquids, they shall be protected by either and air line or filter respirators, except as otherwise provided in regulations of this part."

For comparison to the degree of risk and hazard, the Department of Labor also used the occupational exposure level of 5 MPPCF as the same absolute value for high "free" crystalline silica dust (greater than 50% free silica). The silica value is also the same value established by the ACGIH in 1942 and promulgated in 1946. These nationally-enforced regulations, as well as the requirements of the Walsh-Healey Public Contracts Act, were applicable to private (non-government owned) shipyards.

33. The use of the 5 MPPCF level as the occupational exposure value continued to be generally accepted by professionals practicing occupational health in the United States. This occupational exposure value, and the widespread use of asbestos, continued in the Navy until the late 1960s when the scientific and medical communities (Selikoff 1965, 1967) and the United States Navy (Turnbull, 1969; OiC NAVSEC, Philly, 1969; COMNAVSEC, 1971; COMNAVSHIPSYSCOM, 1971; COMNAVSEC, 1972; COMNAVSEASYSCOM, 1975) had evidence that it was not sufficient to adequately control the health effects of exposure. This level was then changed, by the fledgling Occupational Safety and Health Administration (OSHA), to a time-weighted average of 12 fibers per cubic centimeter (12 f/cc) in May, 1971 and then to an Emergency Temporary Standard (ETS) of 5 f/cc in December, 1971. On June 7, 1972, the Federal asbestos regulations "Part 1910–OCCUPATIONAL SAFETY AND HEALTH STANDARDS: Standard for Exposure to Asbestos Dust" was published permanently reducing the permissible exposure limit of a time-weighted average to 5 f/cc. The new Federal standard also contained an extensive asbestos control program which was required of all employers. This "OSHA Asbestos Standard" which was quite similar to the Navy instruction released by the Navy the previous year (February, 1971): "NAVSHIPSINST 5100.26: Control of Asbestos Exposure Hazards" (DoN, 1971).

34. The Navy's sophistication regarding asbestos hazards in the 1960s was thus at the the cutting edge of then existing science and medicine. Captain NE

Rosenwinkel, MC, USN, representing the Navy's Surgeon General and the Bureau of Medicine and Surgery, provided information regarding the Navy's knowledge of asbestos hazards to shipyard employees for inclusion in a statement issued by Rear Admiral JJ Stilwell, USN, of the Shipyard Management Directorate, Naval Sea Systems Command in 1968 (Rosenwinkel, 1968):

> ***"The United States Navy is well aware of the hazards of asbestos to its employees engaged in ship construction and ship repair at naval shipyards. Hazard control measures implemented by the shipyard medical departments and safety divisions are in accordance with accepted standards of industrial hygiene practices in the United States. Stringent efforts are directed at keeping the concentration of airborne asbestos dust below the level recommended by the American Conference of Governmental Industrial Hygienists. An energetic periodic physical examination program insures the health of personnel exposed to this hazard."***

35. During the late 1960s, the state-of-the-art regarding the known health hazards of asbestos changed both inside and outside the Navy – as well as other US Government Departments and Agencies and private employers. Procedures to control asbestos exposures were made more stringent as the accepted – and now legally enforced – occupational exposure levels were reduced. Insulation manufacturers started including precautionary statements on their packaging in the early to mid-1960s. Asbestos exposure and

control were being addressed at different levels of command throughout the Navy. The Naval Ship Engineering Center was searching for substitutes for thermal insulation products which could meet the rigorous engineering requirements for shipboard applications: ***"Letter inquiries addressed to the Naval Shipyards resulted in 100% responses, whereas those addressed to private shipyards failed to elicit replies from Newport News Shipbuilding and Drydock Co. and Ingalls Shipbuilding Corp. However, General Dynamics, Lockheed Shipbuilding and Bath Iron Works responded to our inquiry."*** (COMNAVSEC, 1969). A meeting between senior engineering, safety, and medical personnel was held to evaluate possible methods for reducing exposure and to make recommendations to the Chief of Naval Operations. (Turnbull, 1969) Major Navy shipyards were sharing their research on asbestos exposure and control measures. (Mangold, 1970) Private contract shipyards were similarly controlling asbestos exposures and seeking suitable substitutes that were acceptable to the Navy and the Maritime Administration.

36. As mentioned, it was not until 1971 that statutory "permissible exposure limits (PELs)" became nationally established (and mandatory) under the Occupational Safety and Health Act (PL 91-596). These standards and their specific requirements applied to the employer, as the source of control of safety and health hazards in the workplace. Although these national standards applied to shipyards and other industries using asbestos, they did not directly apply to active duty Navy personnel and military unique settings. However, under a series of Executive Orders, the

Navy maintained an occupational health and safety program consistent with OSHA requirements. At the time of enactment in 1971, the PEL for asbestos was initially 12 fibers per cubic centimeter (f/cc). However, based upon the evolving and current scientific and medical recommendations by the time of enactment, the Occupational Safety and Health Administration (OSHA) emergently lowered the PEL to 5 (f/cc) (ceiling value of 10 f/cc) in late 1971, with a permanent standard of 2 (f/cc) becoming effective in 1976. The 1971 OSHA "Asbestos Standard" specifically addressed labeling of asbestos-containing materials based upon friability and the potential release of asbestos fibers into the air which would exceed the permissible exposure limit:

> ***"(2) Caution Labels.***
>
> ***(i) Labeling. Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos in excess of the exposure limits prescribed in paragraph (b) of this section will be released."(OSHA, 1971)*** [EMPHASIS ADDED]

As discussed previously, based upon the permissible exposure limit criteria at the time that OSHA was enacted in 1970, non-friable asbestos-containing components used for electrical and fire retardant properties

in insulation applications, as well as typical gasket and packing materials, did not require labeling due to their composition and friability. Even before this period, these types of materials were not considered to present any hazard during routine use and handling (Fuller, 1945). In 1975, OSHA recognized sufficient medical and scientific evidence of human carcinogenicity to recommend the reduction of the permissible exposure limit to 0.2 f/cc. After legal challenges, OSHA reduced the PEL to 0.2 f/cc in 1986, and further reduced it to its current value of 0.1 f/cc in 1994. Requirements from the highest levels of authority in the United States Navy established the permissible occupational exposure levels and control methods as they changed during this post- OSHA era. (DoN, 1971; BUMED, 1973; OPNAV, 1974) The Navy took further additional steps to eliminate the use of ***"asbestos in ship construction and maintenance, and to direct actions which will further reduce asbestos exposure"*** through its Asbestos Elimination/ Substitution Personnel Protection Program (COMNAVSEASYSCOM, 1975).

37. The Navy has continued to follow the policy of using occupational exposure levels based upon the best available scientific and medical information (BUMED, 1955). The federal PELs, established by the Occupational Safety and Health Act of 1970, were generally based upon the American Conference of Governmental Industrial Hygienists' Threshold Limit Values (TLVs) published in 1968. Due to statutory requirements, changes to the limited number of chemical PELs have generally been slow. PELs have been changed for a relatively few chemicals since the enact-

ment of OSHA in 1970. The TLVs are periodically reviewed and an updated list is published annually. The TLVs more closely reflect the current state of knowledge and professional practice in occupational health. The Navy continues to use the most appropriate occupational exposure levels in the assessment of exposures and follows the requirements stated in the Chief of Naval Operations Instruction "OPNAVINST 5100.23F" (CNO, 2002) to provide workplaces that reflect the state–of–the–art knowledge and technology, consistent with its defined mission:

> ***"The maintenance of a safe and healthful workplace is a responsibility of commands throughout the Navy. A successful Navy Occupational Safety and Health (NAVOSH) program, one that truly reduces work-related risks and mishaps, results only when support and commitment to the program permeate every level of an organization. Within the Navy, the Chief of Naval Operations (CNO) has overall responsibility for the NAVOSH program and implements the program through the chain of command. Line management is responsible for the maintenance of safe and healthful working conditions."***

38. The Navy's modern safety program started in 1917 with safety engineers assigned to each naval shipyard. This initial program was expanded in 1922 with safety programs for civilian employees being introduced at all naval activities (NAVEDTRA, 1993). The Navy's Safety Program was driven from the highest level of authority and operational command – the Chief of Naval Operations (CNO). The "United States

Navy Safety Precautions," OPNAV 34P1, was signed out by the Acting Secretary of the Navy, CS Thomas, on 8 June 1953 (CNO, 1953). In his "charge" written in this instruction, Mr. Thomas states:

> ***"The safety of its personnel and the preservation of its materials have always been a major concern of the Navy Department. Evidence of this is the provision in Article 0406 of U.S. Navy Regulations, that "Each Naval Technical Assistant shall prepare and issue to the Naval Establishment the safety precautions, and instructions pertaining thereto, which are necessary or appropriate in connection with matters under his technical direction."***
>
> * * *
>
> ***"In recognition of the burden of responsibility which a commanding officer has for the personnel and material under his command, a governing article, 01104 Basic Rule of Responsibility, has been included to allow for adjustments to local conditions and unusual circumstances. The complete text of this article not only appears in Chapter 1, but is reprinted on the title page of each chapter of the book."***

The "Basic Rule of Responsibility" states:

> ***"Safety is a command function. Responsibility for the safety of personnel is vested in the commanding officer. Because these safety precautions apply only to usual conditions, commanding officers or others in authority may find it necessary to issue***

> ***special precautions to their commands to cover local conditions and unusual circumstances. In addition to the posting of appropriate precautions, careful instruction and indoctrination of all personnel are necessary to ensure effective compliance with these precautions."***

The Navy's comprehensive Safety Program was in existence before the Second World War and it continues to this day through the "Safety Precautions for Shore Activities" (initially OPNAV 31P1: United States Navy Safety Precautions (CNO, 1953); later NAVSO–2455 (OCMM, 1965): now NAVMAT P-5100 series (NAVMAT, 1970)) and "Safety Precautions for Forces Afloat": OPNAVINST 5100.19 series (CNO, 1973), and the "NAVOSH (Navy Occupational Safety and Health) Program Manual": OPNAVINST 5100.23 series (initially CNO, 1983). The "Naval Ships' Technical Manual (NSTM)" chapter on thermal insulation: "Chapter 9390: Thermal Insulation" was specifically revised to stress "Safety Precautions for Asbestos" in July 1972 and address the Navy's increased vigilance in controlling asbestos exposure onboard ship. The initial Navy-wide Safety Program combined both shore and shipboard environments (CNO, 1953):

> ***"2. Shipboard Safety. In most instances the hazards involved and the applicable precautions for a given type of work are the same whether the work is done afloat or ashore. Precautions afloat are therefore not presented separately from precautions ashore except when they concern specific shipboard activities or conditions."*** [EMPHASIS ADDED]

. . .

"Delegation of Authority. <u>While the commanding officer cannot delegate the responsibility for the safety of personnel</u> under his jurisdiction, <u>he may delegate his authority</u> to the executive officer and other subordinates to ensure that all prescribed precautions are understood and strictly enforced." [EMPAHASIS ADDED]

. . .

"11312 Certification of Closed Compartments

1. Entry into Closed or Poorly Ventilated Spaces. <u>No person shall enter any closed compartment or poorly ventilated space in any naval unit including naval or Navy operated vessels unless and until a "gas-free" certificate has been issued</u> by the safety engineer or his authorized representative to certify that the danger of poisoning or suffocation of personnel, or the danger of ignition or explosion of flammable gases has been eliminated or reduced to the lowest practical minimum.

2. Entry in Emergencies. In case of emergency, when it is necessary to send a man into a compartment or tank not certified as being gas-free or as containing sufficient oxygen, the man shall be equipped with an air-line mask or an oxygen rescue breathing apparatus." [EMPHASIS ADDED]

. . .

" 11322 Definition of terms

1. Closed Compartments or Poorly Ventilated Spaces are any spaces that are not well ventilated, or which have been closed for any appreciable length of time. Unventilated storerooms, blisters, double bottoms, tanks, cofferdams, pontoons, voids, idle furnaces, cold boilers, etc., are typical." [EMPHASIS ADDED]

. . .

"Do not clean chips from the surface of machines with compressed air or with hands. A brush or hook should be used."

. . .

"The cleaning of one's clothes with compressed air is prohibited."

. . .

"Compressed Air. Compressed air shall never be blown towards anyone, used for cleaning of personal clothing, or used to cool a person off."

39. In order to coordinate sharing of occupational health information between organizationally distinct, and geographically distant, naval activities, the Bureau of Medicine and Surgery instituted the quarterly publishing of occupational health reports: "Occupational Health Hazards" during World War II. These reports were initially received by the Bureau of Medicine and Surgery from all field commands staffed with occupational health professionals, condensed, and redistributed to all the submitting commands (BUMED,

1955; 1959, 1961a, and 1961b). Later, the Navy Environmental Health Center continued this function until the late 1990s when electronic information sharing made the earlier process obsolete. These reports demonstrate that the sharing of industrial hygiene and other occupational health information and services between commands throughout the Navy was common since early in World War II.

40. Based on my education, training, and experience, it is my professional opinion that the Navy, the Maritime Commission, and other Federal Departments and Agencies were well aware of the health hazards associated with the use of asbestos from the early 1920s, consistent with the evolving state of knowledge at a given time. The Navy's extensive asbestos control program was the best in the Nation – controlling exposure to airborne asbestos fibers to a level below that known to be associated with either asbestosis or lung cancer – the only two asbestos-related pulmonary diseases known before 1960. Hueper, writing on occupational and environmental cancers in 1966, added mesothelioma to the cancers associated with clinical asbestosis, and notes the lack of long-term medical and pathological studies involving individuals exposed to asbestos dust. Although the control of asbestosis was accepted as also controlling the potential for further development of either lung cancer or mesothelioma, more data and analyses were needed at that time (Hueper, 1966).

> ***"Since the presence of asbestosis has usually been considered the prerequisite for the subsequent development of a carcinoma of the lung or of a mesothelioma of***

the pleura or of the peritoneum, these deficiencies in the available information tend to impair a clear demonstration of the real scope of the existing associations between the two conditions. A second difficulty encountered in reliably assessing the extent and degree of lung cancer hazards of asbestotics is represented by the fact that there has occurred in the past a confusing duplication in reporting cases of asbestosis cancers."

The Navy's and, similarly, the US Maritime Commission's decisions to use asbestos-containing materials were based upon operating requirements and missions in light of the known health hazards at the various periods of time. The Navy had a longstanding and notable occupational safety and health program that addressed asbestos and many other health hazards, and that provided exposure control recommendations and methods that were consistent with the state-of-the-art knowledge in science and medicine. The Navy operated under the premise that control of the exposure to asbestos fibers could essentially eliminate the hazard of a material considered essential for sustained Navy operations. Using established scientific and medical knowledge, the Navy developed an active program to control the release of asbestos fibers in dusty operations, as well as, to monitor the health of workers at risk. Indeed, the very first articles associating "by-stander" exposure with asbestos were not published until 1965, and the exposure situations were different from those in the US Navy (Newhouse and Thompson, 1965a; 1965b). The landmark study of Fleischer-Drinker, reported in 1945, confirmed the

general thought that exposures in the Navy to asbestos containing materials could be controlled and health effects could be limited by medical surveillance. Navy industrial programs were directed at controlling what was considered significant releases of dust. During the period from about 1938 through the later 1960s, the widely accepted occupational exposure level was 5 MPPCF. In the mid-to-late 1960s, the Navy led the way in assessing asbestos exposure of personnel and developing a program and process to eliminate the material based upon new scientific and medical information that was becoming available.

41. To the extent that the equipment and product manufacturers with which I am familiar ever delivered equipment to the US Government for use on vessels constructed for the US Navy and the Maritime Commission/Administration, the US Government had already recognized that the prolonged inhalation of sufficient concentration of respirable asbestos fibers could result in pulmonary disease. Indeed, this knowledge was held by the US Government prior to the period of construction of ships in the 1940s (Dublin, 1922; Jenkins, 1939; Bureau of Medicine and Surgery, 1939). Based upon that scientific and medical knowledge, the US Government, generally, and the US Navy, specifically, by the early-to-mid 1940s had already developed an active and robust program to control exposure to airborne asbestos fiber concentrations at levels recognized to be harmful, and medically monitored personnel exposed to those levels. Additionally, the Navy established engineering control procedures (including isolation, exhaust ventilation, wet methods, and process changes to minimize dust

release) and training, and required the use of respiratory protection for personnel considered to be at risk of excessive exposure during dusty operations (Dublin, 1922; Brown, 1941; Forrestal, 1941; Knox, 1941). These dusty operations primarily arose from the handling and use of the friable asbestos used in thermal insulation applications. Control of exposure to asbestos fibers based upon the concentration and duration – sufficient to prevent asbestosis – was considered by medical authorities, both international and domestic, to concomitantly control the (then believed) causal relationship between asbestosis and pulmonary cancers. (Smith, 1952; Doll, 1955; Hueper, 1966) Indeed, the levels discussed in the landmark studies by Merewether and Price (1930a, 1930b, 1933a, 1933b, 1934) to prevent the development of asbestosis were actually far above the occupational exposure level of 5 MPPCF used by the US Navy. Thus, by controlling the exposure of personnel to asbestos fibers and preventing the development of asbestosis, the Navy, based upon the consensus of the scientific and medical communities of the day, *de facto* controlled the potential for the development of respiratory cancers. It is further worth noting that, at this time period, the Navy and other US Government Departments and Agencies, and the scientific and medical communities in general, were **not** seeking to control the smoking of tobacco products as the significant cause of the rising lung cancer rate.

42. Under the accepted occupational exposure "guideline levels" of the time period before the enactment of OSHA (there were no national, statutory occupational exposure levels (OELs)), there was absolutely no hazard created by the handling and use of

asbestos in gasket and packing applications in naval steam systems – or likewise – in non-friable, asbestos-containing electrical insulating components. The potential release of respirable asbestos fibers was, and still is, minimal from these sources (Liukonen et al, 1978), as well as in cable, wire, and other electrical applications – such as bound phenolic resins and "fish paper" insulation – based upon my own personal knowledge and professional experience, as well as the many studies cited by Mowat et al., 2005, and Williams and coworkers, 2007. Many Navy and other published studies have confirmed that the greatest potential for exposure to airborne asbestos fibers onboard ship comes from the uncontrolled application and removal of thermal insulation, not the handling of gaskets and packings, or wire, cable, and other electrical components. (Robbins and Marr, 1962; Marr, 1964; Harries, 1971; Liukonen et al, 1978; Mowat et al., 2005; Williams et al, 2007; Hollins et al, 2009) Attention to even the potential for release of asbestos fibers from non-thermal insulation materials only arose as the permissible exposure limit (PEL) for asbestos decreased dramatically following the enactment of the Occupational Safety and Health Act in 1970, and the environmental controls of the "US Environmental Protection Agency National Emission Standard for Asbestos" (US Congress, 1971) and the Toxic Substances Control Act (TOSCA) (USEPA, 1976) regulated asbestos as a controlled environmental pollutant. Prior to that period in the early to mid-1970s, the Navy and contract shipyards (and other federal and state entities) were using 5 million particles per cubic foot (5 MPPCF) as the occupational exposure level for asbestos; environmental releases into air, water, and

land were not regulated. It was not until the accepted occupational exposure levels of the post-OSHA period decreased that the possible release and exposure to asbestos fibers from the handling of gaskets and packings at concentrations approaching the new OEL became a concern. Prior to the 1990s, the Navy study by Liukonen and coworkers (1978) at the Puget Sound Naval Shipyard (PSNSY) stands out as one of the few, and best known, evaluations of such materials. This study demonstrated that gaskets did not present an asbestos hazard under normal conditions to individuals who were directly working with such materials.

43. Similarly, Captain JC McArthur, USN, addressing a Congressional subcommittee on behalf of the Navy, noted in 1978 (McArthur, 1978):

> ***"In addition to thermal insulation, other shipboard asbestos applications include those products which can be found in general use by industry and in homes and office buildings. Floor tiles, various gaskets and valve stem packings and galley range insulation are just a few examples. However, this asbestos is in a bonded or contained form and routine careful handling would preclude emissions of potentially hazardous levels of airborne fibers."***

Again, at the time that this official statement was made by CAPT McArthur in 1978, the permissible exposure limit (PEL) of 2 fibers per cubic centimeter had been established under the Occupational Safety and Health Act of 1970 (US Congress, 1970). This level was also used by the United States Navy at that time. This level of 2 f/cc was significantly lower than the OEL used by the US Navy during the period from the

1940s through the late 1960s – 5 million particles per cubic foot (5 MPPCF; approximately 30 f/cc).

44. An earlier study performed at the same Puget Sound Naval Shipyard (Mangold et al, 1970) evaluated asbestos controls and the prevalence of clinical findings associated with uncontrolled exposure to airborne asbestos fibers. It must be emphasized that Mangold's study was conducted among a population of shipyard workers who had their total period of employment before the strictly-mandated exposure controls and permissible exposure limits were established under the Occupational Safety and Health Act of 1970. Furthermore, personnel listed under the various trades were included in the study based upon their current working position – not their past occupational history; this is an important confounder. These federal employees ("civil servants") were shipyard craftsmen who worked daily in specific trades building, repairing, overhauling, and modernizing Navy ships – their tasks and duties were not equivalent to those of the Sailors who primarily operated and maintained that shipboard equipment at sea-but rather, their shipyard duties represented the extreme in an exposure analysis. Mangold's study identified 22 of 104 pipecoverers (21.2%) with "positive chest x–rays" which were suggestive of prolonged asbestos exposure, whereas only 6 of 765 pipefitters (0.8%) had such findings. The former group was responsible for insulating pipes and equipment on a daily basis; the latter group was comprised of individuals who routinely worked with bare, uninsulated metal piping and equipment. In contrast, shipboard repair of thermal insulation by Navy Machinist's Mates was normally restricted to

minor patching under usual operating circumstances (Bureau of Naval Personnel, 1958):

> ***"MAINTENANCE AND REPAIR VALVES AND PIPING:***
>
> ***Aboard ship you are responsible for the routine maintenance of valves, and piping assemblies in your assigned spaces. In addition, the qualifications for advancement in rating require that you know how to make minor repairs to insulation or lagging in piping; how to reface valve seats and disks; and how to repack high-pressure valves. Unless the piping system and valves are in good condition, the connected units of equipment and machinery cannot be operated efficiently, and the safety of the ship's personnel may be imperiled."***

This restriction was due to the scope of what could be repaired at sea, the limited availability of parts and insulating materials, and/or the need for heavy equipment or specialized tools to perform major repairs. Additionally, the Navy developed "portable" or "removable" pads, or "insulation blankets", for use on access portals or surfaces/areas when frequent access was required. This reduced exposures to asbestos dust which resulted from removing and replacing hard covering (block/pipecovering and cement (mud)).

Navy Boilermen (BTs) were also expected to perform similar minor repairs on such piping as part of their routine duties. (BuPERS, 1956)

> ***"As a Boilerman, you will be required to install or patch insulation and lagging on***

steam lines and on other fireroom piping. It is important for you to know what materials are suitable for the various services and to know how to apply these materials.

In general, the materials used to insulate piping include the insulating material proper the lagging or covering and the fastenings which are used to hold the insulation and lagging in place. In some instances the insulation is covered by material which serves both as lagging and as fastening."

. . .

"Insulating materials must always be selected with regard to the temperatures to which they will be exposed. In addition to the actual insulating characteristics of the material such characteristics as structural strength, resistance to shock and vibration, chemical stability, fire-resistance, and ease of application and repair must be considered. Insulating materials commonly used on high-temperature piping include magnesia-asbestos composition, mineral or rock wool, asbestos, fibrous glass and several types of insulating cements."

. . .

"Asbestos is used for many insulating purposes and is provided in various forms Asbestos cloth is used as lagging over insulating material on valves fittings flanges and pipes. Asbestos felt is used for both

low-temperature and high temperature insulation. Flameproof asbestos in the form of soft flexible sheet is used for lagging and insulation where space does not permit thicker or more rigid forms of insulation."

While performing such minor and occasional tasks involving external thermal insulation, the exposure of Sailors – either Machinist's Mates or Boilermen – to airborne asbestos fibers was not considered to be excessive. Again, under shipyard or "tender" conditions where there could be a substantial amount of such work being performed, strict dust controls were mandated. However, when considering the actual time and duration of these limited and infrequently-performed tasks while underway at sea, or in port by the ship's crew, the total exposure (dose = concentration x time) to airborne asbestos fibers was not considered by Navy occupational health professionals to be excessive or hazardous. (BuMED, 1961a) When possible, control of fiber release during the dustiest task of removal would be aided through the application of water – however, in some emergent conditions when hot steam system components required immediate attention, the use of such wet methods could be catastrophic.

In Mangold's study of personnel who had been working under the historically less restrictive occupational exposure guidelines of 5 MPPCF that were followed during the decades preceding his study reported in 1970, marine machinists and machinists had "positive chest x-rays" in 0 of 490 (0%) and 1 of 536 (0.2%), respectively. These two groups comprise the trades that would most commonly work directly with equipment

located in shipboard machinery spaces – such as valves, pumps, and turbines. The "boilermakers" in this study (tradesmen actually constructing, making major repairs, and re-building boilers – not operating and maintaining them like Navy Boilermen – had "positive chest x-rays" in 4 of 115 (3.5%). At this point in time, the association of a shipyard "Boilermaker's" tasks with only occasional work with asbestos-containing materials and the excessive risk of developing an asbestos-related disease were just beginning to be appreciated (Mangold et al., 1968, Mangold 1969c, Selikoff, et al., 1979). There were 574 individuals included in the category of "electrician"; there were no individuals with "positive" chest x-ray findings in this large group. As a control or comparison group in this study, 1 of 420 clerical workers (0.2%) had a "positive chest x-ray". The "marine machinists" (also called "outside machinists") performing tasks like removing and replacing shipboard machinery, had "positive chest x-rays" in 1 of 536 (0.2%) – similar to that of the control group of clerical workers. For comparison with active duty US Navy personnel, the "corresponding" shipyard job categories and day-to-day responsibilities of shipyard workers differed significantly from these Sailors with respect to intensity, duration, and frequency of potential airborne asbestos exposure. Navy Machinist's Mates (MMs), Boilermen/Boiler Tenders/Boiler Technicians (BTs), and Enginemen (ENs) primarily operated the machinery, and performed limited maintenance and repairs when necessary in order to keep the ship operating. Major repair operations were restricted to yard periods, or, when necessary, periods of availability with a Navy tender using skilled personnel and specialized tools and

equipment. The differences in the type of work and exposure to asbestos fibers between shipyard workers and operators are discussed and accounted for by Williams and co-workers (2007). Table I is derived from Mangold and co-workers, 1970):

TABLE I: INCIDENCE OF POSITIVE CHEST X-RAY FINDINGS IN OCCUPATIONAL GROUPS

18) Shipfitters	19) 890	20) 6	21) 0.7
22) Sheetmetal Workers	23) 489	24) 6	25) 1.2
26) Forge Workers	27) 32	28) 0	29) 0.0
30) Welders	31) 998	32) 11	33) 1.1
34) Machinists	35) 536	36) 1	37) 0.2
38) Marine Machinists	39) 490	40) 0	41) 0.0
42) Boilermakers	43) 115	44) 4	45) 3.5
46) Electricians	47) 574	48) 0	49) 0.0
50) Pipe Coverers & Insulators	51) 104	52) 22	53) 21.2
54) Pipefitters	55) 765	56) 6	57) 0.8

58) Ship-wrights & Joiners	59) 228	60) 0	61) 0.0
62) Electron-ics Mechan-ics	63) 280	64) 0	65) 0.0
66) Painters	67) 263	68) 4	69) 1.5
70) Riggers	71) 664	72) 1	73) 0.1
74) Temp Ser-vice Mechan-ics	75) 143	76) 1	77) 0.7
78) Clerical workers	79) 420	80) 1	81) 0.2

Due to the potential for shipyard insulation workers to experience frequent, intense, and prolonged periods of direct work with asbestos-containing materials in the shipyard setting, the emphasis of the Navy's program, as well as the programs established under US statutes, such as the Walsh-Healey Act (1936) and the "Safety and Health Regulations for Ship Repairing" (1960), were principally directed at shipyard exposures to airborne asbestos fibers for both the employed civilian personnel in their daily tasks – as well as active duty Sailors during shipyard periods as discussed by Wynkoop (1947) and Franklin (1964). The multiple "components" of the Navy asbestos control program, as well as the program required under the "Safety and Health Regulations for Ship Repairing" (DoL, 1960) existed to control and minimize untoward exposure to airborne asbestos fibers from thermal insulation materials. Control of exposure was effected through the adoption of an occupational exposure level (OEL) based upon the best available scientific and medical information at the time; establishment of the methodology to evaluate exposures; use of industrial hygiene

control measures (local exhaust ventilation; wet methods); use of personal protective equipment including respiratory protection, product substitution; periodic medical evaluations; recordkeeping; and local training and awareness programs – all required, as necessary, based upon the potential for the release of asbestos fibers from friable materials.

45. The review by Dr. PRD Williams and co-workers (2007), as well as the large studies of US Navy shipyard workers conducted by Mangold and co-workers (1970) and British dockyards by Harries (1968; 1971), discuss the traditional tasks and practices which resulted in airborne asbestos fiber exposures of electricians – a trade that was not considered to be at risk from working with asbestos–containing materials during the pre-OSHA period. The airborne asbestos fiber concentrations were less than the recommended exposure guidance level (pre-OSHA) or statutory occupational exposure limit (post-OSHA) during the various time periods until 1976, when the OSHA Asbestos PEL became 2.0 f/cc. Prior to 1976, airborne asbestos concentrations to electricians were not generally thought to result in clinically significant exposures. As the OSHA Permissible Exposure Limit (PEL) was lowered after 1970, the responsibilities of the employer were defined while the widespread dissemination of information concomitantly occurred. The April, 1971 issue of "The Electrical Workers' Journal" contains an article on the newly promulgated "Occupational Safety and Health Act" and states that:

> ***"AFL-CIO President George Meany termed the Occupational Safety and Health Act "a long step down the road toward a safe and healthful work place," but he stressed that***

> ***"achievement of that goal will not be automatic." He warned that labor will keep a watchful eye on the enforcement machinery, stressing that, it it doesn't work effectively, "we will immediately petition Congress to strengthen and improve it."*** (Pillard, 1971)

Mr. V Cohn's 1972 Washington Post article reflects the knowledge of the nation's largest federation of unions – it is titled: "AFL-CIO Warns on Asbestos Cancers". The International Brotherhood of Electrical Workers (IBEW) was an affiliate of the AFL-CIO. The June, 1973 issue of "The Electrical Workers' Journal" contains an article detailing "The Target Health Hazards" under OSHA – which lists "Asbestos" prominently as the first of the five nationally-targeted health hazards. This article even lists the applications of asbestos under:

> ***"Where is it? The heat-resistant properties of asbestos have led to many uses – for example, protection against fire, insulation, brake and clutch linings, building materials, filter materials, and in plastics. The raw material and end-products are found nearly everywhere."***

This article also lists the hazard and health consequences of asbestos exposure. The June, 1978 issue of "The Electrical Workers' Journal" contains another article dealing with Asbestos Related Diseases. Dr. Irving Selikoff, writing in "The Asbestos Worker" (for the Association of Heat and Frost Insulators and Asbestos Workers – another affiliate of the AFL-CIO) discusses "New Mask Undergoes Field Test" in the May, 1969 issue and his efforts to find an air-filtering

respirator which is both suitable, as well as acceptable, to insulation workers.

46. The information possessed by the US Navy, the Maritime Administration, and other Federal Departments and Agencies with respect to the specification and use of asbestos, and the health hazards associated with its use onboard US vessels, far exceeded any information that possibly could have been provided by an equipment manufacturer. An equipment or product manufacturer had absolutely no authority, responsibility, or control over the US Navy or private workplace, or the respective personnel – all essential aspects in hazard communication and control. The Navy had long recognized and accepted the responsibility of command, or the "employer's role" as the controller of the workplace, in the practice of occupational safety and health. This was also recognized under the Occupational Safety and Health Act; the Act was put into effect through the employer – with the adherence of the employee. It must be noted that the asbestos-related and other standards of the Occupational Safety and Health Act of 1970 were mandatory for all private employers including shipyards; OSHA did not include Executive Branch Federal workers nor the military. However, under Section 6 of this Act, Federal Departments and Agencies were directed to establish and maintain comprehensive and effective occupational safety and health programs consistent with the standards of the Act. Additionally, Presidential directives (Executive Orders) were issued in 1971 (EO 11612), 1974 (EO 11807), and 1980 (EO 19126) requiring each Federal Department or Agency to comply with the OSHA standards. A series of wide-reach-

ing Navy directives, referenced above, were promulgated to meet these requirements. It is obvious that, based upon the knowledge at any given point in time, the Navy and the Maritime Administration were fully aware of the health hazards of asbestos and had programs dating back before World War II to control exposure of personnel and monitor their health; and that this knowledge persists through the present day. The knowledge of the hazards created by the use of asbestos containing materials was weighed with respect to the vital benefits provided by its use. The Navy controlled asbestos exposure consistent with the then current state of accepted scientific and medical knowledge balanced by needs for national defense. The Navy's asbestos control program, at all times discussed above, was multifaceted and complex, and included hazardous process identification, engineering controls, use of alternative materials in accordance with Navy specifications and contract requirements, personal protective equipment, training and education, and medical surveillance – all when indicated by the level of exposure to airborne asbestos fibers. A mere warning statement, possibly confusing and always superfluous – and perhaps even incorrect and in direct opposition to established Navy policy and procedures – would have added nothing to the Navy's existing occupational health program for the control of asbestos exposure to the hazardous concentrations universally accepted at various points in time from the 1920s until the present time. However, in the mid-1960s, primary asbestos manufacturers of thermal insulation materials began placing a warning on their friable thermal insulation products (Johns-Manville, 1964); this label contained information similar

to that later required for such friable products under the Occupational Safety and Health Act asbestos standard (DoL, 1972). Additionally, it must be remembered that the Navy's occupational health program existed through periods of war and military conflicts and was an additional consideration in the decision-making process at all levels of the Navy command structure.

47. Concomitant with the dissemination of information within the Navy and the Federal Government, as alluded to briefly above, labor unions also were involved with advocating and ensuring compliance with the new Federal standards (Cohn, 1972). Dr. IJ Selikoff, a physician deeply interested in the identification of risks and exposures among a much more intensely-exposed group – namely the insulation workers in the United States, worked closely with the AFL-CIO's affiliate, the Association of Heat and Frost Insulators and Asbestos Workers, during the 1960s and 1970s to assess asbestos exposures, confounding factors, and the development of disease. In 1965, Dr. Selikoff writing with Churg and Hammond noted.

> ***"Scattered case reports have previously been recorded of neoplasms among insulation workers, including both lung cancer and mesothelioma of both the pleura and peritoneum. A lung cancer has also been reported in a workman in a factory making asbestos Insulation. However, these reports, while interesting and valuable, could not establish an association between the two conditions."***

In that same year, Hammond (1965) commented on the level of inhalation asbestos exposure of full-time

insulation workers who experienced daily exposures to levels of airborne asbestos fibers also far greater than those of sailors "steaming ships" and performing occasional work on steam systems with external, asbestos-contain insulation:

> ***"I believe that there was hardly anybody a few years ago who would have suspected that there was a lung cancer risk in this group of insulation workers. These men were not asbestos weavers nor asbestos miners, and nobody at that time had suggested an increased risk at all for insulation workers."***

Dr. Selikoff further noted that the association between general shipyard work performing non–routine work with insulation, and the potential for the development of asbestos–related lung disease was not recognized before 1968:

> ***"In 1968, the possibility that asbestos-associated disease might be an important problem of shipyard workers was suggested." (Selikoff, et al., 1979)***

In his address to the delegates of the Twenty–first Convention of the Association of Heat and Frost Insulators and Asbestos Workers in 1967, Dr. Selikoff noted that cigarette smoking was a major factor in the development of lung cancer. At this time, Dr. Selikoff also noted that mesothelioma was a very rare disease which may also be related to some types of asbestos exposure among insulators.

> ***"Also, by the way, I did not see a cancer of the lung in an asbestos worker who smoked cigars or an asbestos worker who***

> ***smoked pipes, if he didn't smoke cigrettes at the same time. If levity were in order at this time, I perhaps should say, "Put that in your pipe and smoke it" (Laughter.)"***
>
> . . .
>
> ***"And something else: There is a very rare disease-and you can break your teeth on this one-called mesothelioma. Nobody knows too much about it I will tell you why nobody knows about it Because it has been so rare that it is not even coded by the U.S. Bureau of Statistics. It is not separately coded in the International Classification of Causes of Death. It is very rare, so rare that at my hospital, from 1930 to 1960, we only saw three cases, and we have a huge hospital, very active."***

In 1965, Newhouse and Thompson (1965a, 1965b) reported cases of asbestos-related disease in individuals who were identified as not having worked directly with asbestos-containing materials. These "bystander" exposures were scientifically untested and unique with respect to the type of asbestos (crocidolite or amosite) – and this conclusion was not universally held by major asbestos researchers (Hueper, 1966). Selikoff, in responding during the "*Symposium on Asbestosis*", published as "Pneumoconiosis: Proceedings of the International Conference, Johannesburg, 1969", stated that he had contacted Dr. Newhouse to advise her that he had reservations regarding the current scientific ability at this time to justify giving an estimate of the risk associated with indirect "environmental exposure" of bystanders or family member and stated:

> ***"It may be very much overrated. All we can say at this time is that there is a significant occupational risk. We have yet no cohort studies on how many people have been exposed in neighbourhood areas or in family exposures. It probably is very much less than we think.***
>
> ***... Therefore, unless we can identify true absence of occupational exposure, we have to regard labels of pure family or neighbourhood exposure with caution.***
>
> ***I think that this is very important. All of us are faced with a very practical problem. What exactly is the exposure with which asbestos disease is associated? We must define this. At the present time, our definition is only that, in specific industrial circumstances, a significant risk occurs. This, I think, can be controlled if we put our minds it On the other hand, much more data are necessary before we can label the magnitude of non-occupational exposures with any degree of accuracy."*** (Selikoff, 1970)

In sum, the scientific and medical data of the period extending through the mid-1960s had not even identified a risk of cancer – specifically mesothelioma – in individuals who were occasionally handling and working with asbestos-containing materials, or those having exposures to inhalable asbestos at low or intermittent levels compared to the widely-accepted occupational exposure level of 5 MPPCF. This conclusion is

fully supported by the leading asbestos-disease investigators of the era – for example Irving J. Selikoff, MD, writing reflectively with DH Lee, MD in 1979:

> ***"The decade of the 1960s provides a convenient time at which to terminate a historical view of asbestos disease. With admirable hindsight from the late 1970s we can see that the essential evidence had already been reported, but not yet assembled or vested with sufficient credibility to be entirely convincing. With few exceptions, the evidence at that time rested on scattered reports of small numbers of cases, and the cases themselves suffered from being either selected or simply those that happened to come to the attention of the reporter. The population base from which the cases came was seldom mentioned. The significance of pleural changes and the occurrence of mesothelioma in persons without a distinct history of exposure remained in considerable doubt. The idea that asbestos could be at least a cofactor in the production of bronchogenic carcinoma was far from fully accepted. That parenchymal asbestosis was very likely to occur in those who had been exposed to heavy dosage in the early years of the industry was clear enough, but what effect environmental controls that had been introduced in the late 1930s might have upon its future prevalence was unknown. The possibility that quite low dosages might have grave consequences 30 or more***

years after first exposure was still unproven.

Many things were needed to confirm the suggestions that were emerging from the studies up to that time. Most importantly, systematic epidemiologic investigation was needed of large cohorts drawn from various types of industry, with the inclusion of adequate control populations. Some of these were already organized, but it was too early for the results to be meaningful. We now know that much of the negative evidence stemmed from coming to conclusions prematurely, before the slow processes of carcinogenesis had had a chance to make themselves evident. We now know also that reduction of heavy exposures that lead to early death would reveal such slowly developing diseases as mesothelioma and bronchogenic carcinoma with increasing clarity. But foreknowledge was not available at the time, although some investigators suspected that the auguries were not good. More sophisticated and sensitive ways of recognizing the disease processes at an early stage, before the appearance of marked radiographic changes, were badly needed. A series of international conferences, some already in the planning stages, were to accelerate these developments greatly. Those who felt that it was an exciting time

were not to be disappointed. The excitement has not even yet been entirely dissipated."

This conclusion is also supported by the earlier articles which were published by Dr. Selikoff in the mid-1960s (Selikoff, Churg, Hammond, 1964; Selikoff, Churg, Hammond, 1965; and Selikoff, 1967.)

WHAT COULD AN EQUIPMENT MANUFACTURER HAVE TOLD THE US NAVY, OR ANY INDUSTRIAL OR COMMERCIAL CUSTOMER?

48. When addressing what asbestos-related information an equipment or product manufacturer or vendor could have provided to the US Navy, the Maritime Administration, or a Department or Agency of the Federal Government, or to any industrial or commercial customer, that it did not already have and consider in its specification and use of asbestos-containing materials, one must realize what was known about the health hazards of asbestos and when it was known.

49. The United States Government's and the US Navy's knowledge regarding the applications of asbestos and the health effects represented the state of the art. During the period from the early 1920s to the late 1960s, there was nothing about the hazards associated with the use of asbestos containing products used on or in equipment on United States Navy ships known by an equipment manufacturer that was not known by the United States Government and the United States Navy. The expected, routine use and handling of asbestos-containing materials during

normal shipboard operations simply presented no significant hazard that was understood by science and medicine of the time period – much less a "special hazard". "Toxicity" is a property inherent in all chemicals as a consequence of its concentration. In the practice and application of toxicology, it is well known that ALL chemicals are toxic as a consequence of dose (Paraselsus [1493–1541]: "*Sola dosis tacit venenum*"—"Dose alone makes the poison") and that "hazard" is a consequence of how a chemical is used. All chemicals under certain conditions can cause harm to a living organism. So, all chemicals may present a hazard under certain conditions. The "conditions of use" and "exposure", and the realization that harm can result define a "hazard" – and the need to control it. A "special hazard" would then be one that is extraordinary, or extremely severe or not expected. Exposure to airborne asbestos fibers of a sufficient concentration for a sufficient period of time could cause fibrosis and damage the lung (asbestosis). The Navy's knowledge and "occupational health program" to control excessive exposure to asbestos predates even the scientific or medical proof that asbestos could cause lung fibrosis by Cooke in 1924, and the use of the term "asbestosis" by Sir Thomas Oliver in 1925. In 1922, the potential for this inorganic dust to cause harm was recognized by Dublin in his "Notes on Preventive Medicine for Medical Officers, United States Navy" and Navy physicians were given a precautionary notice. In this document, Dr. Dublin addresses asbestos exposure as one of the "Occupational Hazards and Diagnostic Signs: A Guide to Impairments to be Looked for in Hazardous Occupations."

50. By the 1950s, control of exposure to airborne asbestos fibers based upon the concentration and duration – sufficient to prevent asbestosis – was considered by medical authorities, both international and domestic, to concomitantly control the (then believed) causal relationship between asbestosis and pulmonary cancers. (Smith, 1952; Doll, 1955; Hueper, 1966) The association of one type of amphibole asbestos with the development of a rare and uncommon type of cancer, mesothelioma, was not demonstrated until several years later with the work of Wagner and his coworkers in 1960. (Wagner et al, 1960) Wagner and coworkers established the association of mesothelioma with a specific type of asbestos, crocidolite, under conditions which were totally different than those found in naval applications or onboard ship – and to a chemically different form of asbestos. The proven association of amosite (the type of asbestos used extensively for thermal insulation on Navy combatant vessels of this period) and mesothelioma was not established until the work of Selikoff and his associates in 1972 (Selikoff et al, 1972). Throughout the period from 1950 until the mid-60s, limiting exposure to airborne asbestos fibers to levels below those which would cause asbestosis, would concomitantly control the development of cancer – either lung cancer or malignant mesothelioma. Federal programs were based upon this sound, and widely held concept.

51. With the increasing use of asbestos in World War II, the Navy expanded its occupational health programs for asbestos and other chemical, physical, and biologic agents which were consistent with the state-of-the-art for each of these potential hazards at that time; these wartime programs were discussed by

Captain Brown in 1941. Philip Drinker, writing as the United States Maritime Commission's Chief Health Consultant to the Navy's Bureau of Ships in 1945, recommended that 5 MPPCF be used as the industrial hygiene control level – even before that level was formally recommended by the American Conference of Governmental Industrial Hygienists in 1946. This is the same value that was used as the occupational exposure level in the noteworthy "Fleischer-Drinker study" published in 1946. This study measured total dust, and asbestos dust, in four US Navy shipyards and onboard ships during various operations, and also evaluated medically-associated outcomes.

52. In one of his early roles as a consultant to the US Maritime Commission and working before the "Minimum Requirements" were enacted in early 1943, Philip Drinker, then at Harvard School of Public Health, led five US Navy officers in the performance of a general Industrial Health Survey of the Bath Iron Works in September, 1942. (Drinker, 1942) This survey reviewed the industrial shore facilities and ships under construction. The ventilation in the Pipe Covering Shop was qualitatively assessed and recommendations were offered:

> ***"The conditions in this shop present a very real asbestosis hazard and immediate steps should be taken to segregate the most dusty processes into a well ventilated area. Local exhaust ventilation of proper design should be installed; however, if conditions can not be completely controlled in this manner, then suitable dust respirators should be worn by the workers. Periodic***

physical examinations of the chests of all workers should be made. Every six months is a reasonable interval."

During this survey in 1942, Drinker and his team noted that a variety of respirators were available for issue, at no cost, in the Tool Room. It was further noted that a program for the repair, cleaning, and sterilization for these respiratory protective devices was in place.

53. In December, 1944, WC Dreessen (a "Surgeon-grade officer" with the US Public Health Service and lead author in the earlier US Surgeon General's Report: Public Health Bulletin No. 241) and Lieutenant Commander WE Fleischer, USNR (a Navy physician assigned to the US Maritime Commission's East Coast Regional Construction Office and lead author in the later "Fleischer-Drinker Report"), formally investigated Bath Iron Works (BIW) regarding "Asbestosis from Amosite Pipe Covering at Bath Iron Works". The BIW shipyard was now performing work under the statutory "Minimum Requirements for Safety and Industrial Health at Contract Shipyards" (1942). As the Chief Health Consultant of the US Maritime Commission, Drinker directed this investigation as his office had ***"heard that there was concern among the pipe covering crews who feared that the amosite was causing some respiratory troubles."*** In the report of their findings, these US Government representatives provided the following:

"1. Provide adequate ventilation at all points where dust is created when handling Asbestos Products and Diatomaceous Earth Products capable of producing Silicate dust.

2. Require all employees to wear suitable approved respirator when engaged in any work where there could be exposure to Asbestos Dust.

3. Provide pre-employment medical examination of the chest area for those who are employed In work where there is exposure to Asbestos Dust. (The purpose of the pre-employment examination is to eliminate prospective workers who have respiratory ailments or who are susceptible to respiratory ailments.

4. Provide periodic medical and chest examinations for all employees engaged in work where there is an exposure to Asbestos Dust. It is suggested that such periodic medical and X-ray examinations be made at intervals of at least every six months." (Dreessen and Fleischer, 1944)

In follow-up reports of total and asbestos dust counts at BIW, the US Maritime Commission industrial hygienist performing the microscopic analysis discussed his findings (Thompson; 1945):

"In all counts except those taken in cutting asbestos, there appeared to be a great deal of material about 1 micron in diameter and of a very uniform size. This did not appear to be in the least fibrous, and I suspect it may be particles of cement which are used in the mixture. Certain of the basic materials used contain large quantities of diatomite."

Dr. CR Williams (1945) performed petrographic analyses of these dust samples at his Harvard School of Public Health laboratory. His results confirm that general area dust onboard ships has variable concentrations of total and respirable asbestos – with the vast majority of dust in non-amosite cutting operations comprised of materials other than asbestos.

54. The Navy's occupational health program not only addressed asbestos exposure, but it had a significant medical component which contributed to advancing the state-of-the-art knowledge. In 1955, Mr. JR Sheehan, an industrial hygienist at the Long Beach Naval Shipyard, wrote to Mr. Webster Ay, the Secretary of the Asbestos Union #20 at that Yard (and one of the individuals involved in the production of the "Grim Reaper" Poster used nationally for asbestos hazard recognition and control since the 1950s), to inform him of the availability of a new medical test being developed by Hurley Motley, MD (at the University of Southern California) to measure early pulmonary function changes and encouraged its acceptance and use among the Yard's asbestos workers, pipe coverers, and insulators. This type of test later became commonly used as it was more sensitive than chest radiography in detecting early lung changes from dust exposure. In addition to industrial hygiene engineering controls, the Navy also developed task specific training for individuals potentially exposed to levels of asbestos exceeding 5 MPPCF.

55. By the 1960s, the then-recognized hazards of asbestos were becoming known within the relevant industries – that is to say, the manufacturers and major users of asbestos thermal insulation. The best scien-

tists of the era were beginning to recognize the association between chronic asbestos exposure among insulation workers and the newly-recognized disease mesothelioma (Selikoff, Churg, Hammond, 1965). At the same time, the major thermal insulation manufacturers began placing asbestos safety caution labels on the packaging of their insulation products – Johns Manville in 1964 and Owens-Corning Fiberglas in 1967. The national insulators' union, and industry, began a major nationwide push to educate thermal insulation workers about the hazards of asbestos. (Selikoff, 1967) Still, the federal government, virtually every state in the Nation, and the world's entire scientific and medical communities universally followed 5 MPPCF as an acceptable continuous, daily occupational exposure level for asbestos. This was a level of exposure associated with asbestos textile manufacturing, career insulation workers, and virtually no one else. Individuals operating equipment with asbestos-containing thermal insulation, or those working with or handling non-friable, asbestos-containing materials in the performance of their duties were not considered to be at risk of developing any asbestos-related disease based upon their types of exposures – and the associated level, duration, and frequency of these exposures. Therefore, they were not typically provided with warnings about asbestos hazards that were thought applicable only to unrelated trades with much more intense exposures – unless the asbestos exposure and release conditions warranted such a warning – such as those found during a shipyard overhaul period – and that warning was associated with processes involving external thermal insulation containing asbes-

tos and not the handling and use of gasket and packing materials, or electrical components. This practice was fully consistent with the state-of-the-art as discussed above by Dr. Irving Selikoff. No additional warning by a manufacturer and/or vendor of equipment (like turbines, boilers, valves, pumps, or electrical equipment), was going to change this well-accepted fact – until the period of OSHA with new scientific and medical information and correspondingly massively increased attention and research on this national "Target Health Hazard" (DoL, 1972). Under OSHA, the statutory, "Permissible Exposure Limits" for asbestos were appropriately lowered as the developing state-of-the-art knowledge indicated the need. Further Federal regulations and mandatory controls were enacted in the early 1970s; these regulations were placed on the employer of the workplace, or the business entity generating asbestos-containing waste, and covered literally all aspects of asbestos use, exposure, and disposal.

56. The occupational exposure level of 5 MPPCF continued to be used by the Navy, as well as other Federal agencies and many states, through the 1960s. However, this long-held "acceptable" occupational exposure concentration was re-evaluated in light of evolving scientific and medical knowledge and underwent incrementally significant reductions following the enactment of the Occupational Safety and Health Act in 1970. (US Congress, 1970) A national, statutory occupational exposure level, now called the "permissible exposure limit (PEL)", did not exist until the promulgation of the Occupational Safety and Health Act, and later as published under the asbestos dust standards (DoL, 1972). Although when enacted, this

national legislation specifically excluded military personnel in unique military workplaces and also did not address occupational health and safety during wartime or military conflict conditions, it did include private shipyards and all personnel working in those yards, as well as other industrial and commercial sites and facilities. The Navy had also adopted its own exposure standards (prior to OSHA) based upon the same occupational exposure levels later established as statutory limits under OSHA (BuMED, 1955; DoN, 1971; BuMED, 1973, and OPVAV, 1974). As mentioned previously, the Navy also took further additional steps to eliminate the use of asbestos as a thermal insulation through its "Asbestos Elimination/ Substitution Personnel Protection Program". (COMNAVSEASYSCOM, 1975)

57. Similarly, under the US Environmental Protection Agency National Emission Standard for Asbestos (US Congress, 1971); National Emission Standard for Hazardous Air Pollutants for Asbestos – "Asbestos NESHAP" (EPA, 1973); and the Toxic Substances Control Act (TOSCA) (USEPA, 1976), asbestos became regulated as a controlled environmental pollutant. Even then, operators of equipment in occupational settings were not, under normal working conditions, expected to be at risk of exposure to asbestos dust levels in excess of the existing PEL. And, to the extent that specific working conditions at a specific workplace did create such a risk, under OSHA, the duty of educating, protecting, and warning the worker fell explicitly upon the employer, as well as the manufacturers of the asbestos materials at issue. Trade unions also became involved. The AFL-CIO – the federation of labor organizations which worked closely

with Irving J Selikoff, MD to evaluate and control the hazards of asbestos exposure among their workers was also very active in the development of national labor legislation. The AFL-CIO President, George Meany, called the Occupational Safety and Health Act passed in 1970 ***". . . a long step ... toward a safe and healthy workplace."*** (New York Times, 1970). When President Nixon signed this milestone Act of 1970, George Meany and other labor figures were present at the ceremony held at the Labor Department. As the control of exposure to asbestos was one of the five major health hazards targeted by this new legislation (DoL, 1972), the labor unions became even more active in identifying excessive asbestos exposures in the workplace and educating their members regarding asbestos hazards and the means of controlling exposure. This union activity actually dated back to the early 1960s. (Sickles, 1961; 1962) Under OSHA, the employers, unions, as well as workers themselves, were all considered to be the important components in maintaining safe and healthful workplaces. Most certainly, shipyard labor unions were very involved in the enactment and enforcement of these standards.

58. Indeed, the Navy stayed abreast of developments regarding the hazards of asbestos and developed sound approaches to the control of exposure to excessive asbestos fiber levels, as evidenced by several programs at various shipyards during the pre-OSHA period before 1970. In the late-1950s, Mr. WT Marr at Long Beach Naval Shipyard, where CAPT Wynkoop, USN had appropriately directed the attention of the Commanding Officers of ships entering the shipyard to the hazards of the overhaul period and provided support personnel and personal protective

equipment in 1947, was investigating alternate sampling and measurement techniques for the evaluation of asbestos – well before the change from a methodology using particle counting to one evaluating fiber length and concentration. The "Grim Reaper" poster emphasizing the need for insulators to wear a respirator when working with asbestos was a product of unionized labor and the safety department at this yard in the early 1960s. At the Boston Naval Shipyard, Mr. Storlazzi was continuing to practice state-of-the-art occupational health and industrial hygiene which had been started by CAPT Jenkins in the late 1930s. One of the earliest commissioned Industrial Hygiene Officers in the Navy, Mr. Seymore Levinson, continuing the work in which he was trained in 1942, directed the industrial hygiene program at the Norfolk Naval Shipyard in the 1960s where he provided exposure assessments and recommendations at this facility. (Levinson, 1965; 1967; 1969)

59. The Puget Sound Naval Shipyard (PSNSY) had a well-established occupational safety and health program which included an asbestos control program. As practiced throughout the Navy, this program was based upon the worker's exposure potential. Mr. CW Richards was the representative from Puget Sound Naval Shipyard in attendance at the Navy-wide "Pipe and Copper Shop Master Mechanics Conference" held in Boston in 1958. At PSNSY, specific program documentation dates back to the "General Safety Rules Manual" promulgated in 1950. (PSNSY, 1950) In this Manual, the following is stated:

> ***"Wherever there are fumes, irritating vapors or heavy dust present in the atmosphere, respiratory equipment is necessary***

for your protection. Consult your supervisor for advice on any problem that may arise. (See Section N, Rules on Personal Health.)

"N4. Wear dust type or air-fed respirators for chipping red lead paint, handling amosite or insulating materials, while dressing abrasive wheels, while working exposed to dust from sand blast operations (wet or dry), and for any other dusty process where effective ventilation cannot be obtained." [EMPHASIS ADDED]

The potential hazards of asbestos were recognized by both tradesmen and occupational health personnel. In addition to providing an overview of insulating materials, the Master Mechanic of the Pipe Covering and Insulation Shop (Shop 56; PC&I) manual on "Marine Pipe Covering and Insulation" adopted in May, 1961 addressed worker safety training.

"Marine Pipe Covering and Insulating" has been assembled through the research efforts of Shop 56 under the direction of the Master Mechanic.

Utilization of this technical trade manual in the field of pipe covering and insulating will improve the vocational and production skills of our present craftsman as well as to "afford intangible benefits in training of new employees.

Chapters I through III will present an interesting introduction to our Navy's magic fibers" which make possible unlimited operating temperatures and pressures in

such critical piping as HIGH PRESSURE STEAM propulsion while affording maximum protection to our operating personnel.

Chapters IV through VI will introduce Pipe Covering and Insulating tools, machinery, and insulating material with their layout and installation.

Chapters VII through X will afford intangible technical data for reference or application.

It is with the profound interest and best wishes of our trade we present this manual." [EMPHASIS ADDED]

This 1961 Manual also provided handling guidance for insulation materials in order to minimize the generation of dust, as well as requiring the use of respiratory protection when appropriate. Using lay terminology and basic medical concepts, the Shop's Master forcefully addresses his supervisors and tradesmen:

"Characteristics of the pipe covering and insulating operations in the shipbuilding industries are such that proper personal safety precautions must be adhered to at all times. Each individual pipe coverer and insulator employee is required to check out and use a respirator when working in insulating areas where there is any danger from exposure to harmful insulating dusts. Supervisors should ensure that their men are properly protected at all times with proper safety equipment and adequate ventilation. Supervisors are not

relieved of responsibility by merely instructing their men to use safety equipment, they are obliged to follow up and ensure that protective measures have been implemented for their crew's health and welfare.

Industrial dusts of all forms have long been thought of as a production evil. Sometimes taken quite seriously, and sometimes taken with a grain of salt, or we might add sardonically, with a micron of silicosis.

Proper control of all harmful industrial dusts can be obtained only through the combined efforts of the workers and management working together to minimize exposures to critical dust and fumes.

The "old timer" or "smart character" may look on humorously as an informed and cooperating worker carefully adjusts his respirator before ripping off reams of amosite or asbestos piping insulation preparatory to a piping alteration. However, it will be the cooperating worker who will have the healthier pair of lungs at the end of the day.

While "Pneumoconiosis" is the technical term applicable for such infections as "Miner's Asthma", "Miner's Phythisis,"(sic) ""Grinder's Rot," (sic) and many others, "Asbestosis" and "Silicosis" are the two most harmful and common lung infections of the pipe covering and insulating trade.

. . .

> ***The infectious characteristics of insulating materials, such as diatomaceous earth (a form of amorphous Silica), asbestos dust, glass or rock wool, and Magnesia, are harmful and do damage to the respiratory system when breathed in excessive and constant amounts."*** [EMPHASIS ADDED]

The Shop's Master used a hand-drawn picture of the human lungs and airways to stress his point of physiologic fragility and the need to comply with safety and health precautions:

> ***"An example of the lung structure with its delicate parts has been included to stress the importance of proper safety or health precautions while performing pipe covering and insulating operations."*** [EMPHASIS ADDED]

The Puget Sound Naval Shipyard's asbestos control program had many other notable developments. Mr. CA Mangold and the occupational health staff at the Puget Sound Naval Shipyard were also very active at this time developing worker education programs while controlling excessive exposure to airborne asbestos fibers in accordance with Navy instructions and statutory Federal requirements as they were promulgated. (PSNSY, 1950; Mangold, 1965; PSNSY, 1966; Mangold, 1967; Mangold, 1968; Mangold, 1969a,b; BUMED, 1969; Barboo, 1969; McBratney, 1969; Mangold, 1970; Beckett, 1976) Training lectures, such a "Practical Industrial Hygiene and Toxicology" were developed for employees and presented

by the Industrial Hygiene Department. (PSNSY, 1965) Technical guides for ventilation (Mangold, 1967; Mangold, 1969a) and respiratory protection (PSNSY, 1966) were also developed by the Industrial Hygiene Department to aid supervisors in the performance of the safety aspects of their positions. Concerned about their medical monitoring findings in light of the industrial hygiene data for the insulators and other industrial trades at the PSNSY, the Medical Department not only informed the workers of their concern (Mangold, 1969a,b; PSNSY, 1969), but also took the initiative to disseminate their findings to other occupational health professionals both inside (Manning, 1968; McBratney, 1969; Mangold et al., 1970) and outside of the Navy (Mangold et al, 1968). The final report of Mangold and his coworkers work on "Asbestos Exposure and Control at Puget Sound Naval Shipyard" (1970) was approved and released by the shipyard Commander, RADM EW Petrovik, USN in March, 1970. This Program was highlighted by the Navy Bureau of Medicine and Surgery for its excellence, and photographic images of shop and ship asbestos control measures in use at Puget Sound Naval Shipyard were put on display at the Bureau in Washington, DC. The information distributed to occupational health personnel throughout the Navy. (Barbee, 1969)

60. The Navy also took further additional steps to eliminate the use of asbestos as a thermal insulation through its "Asbestos Elimination/Substitution Personnel Protection Program" (COMNAVSEASYSCOM, 1975; COMNAVSEASYSCOM, 1976). As the general state-of-the-art medical knowledge regarding the inhalation of asbestos fibers evolved, as well as the development and availability of suitable substitute non-

asbestos materials progressed, the Navy adopted a measured program to replace asbestos thermal insulation. As Vice Admiral Bigley, speaking for the Chief of Naval Operations, acknowledged in his letter dated 5 January 1979 to the General Accounting Office (Bigley, 1979):

> ***"In the case of insulation specifications, changes were made as early as 1971 to specify that the Navy wanted materials with little or no asbestos. By late 1973, these specifications had been changed to call for asbestos-free materials. The fact, however, that these product specifications were changed to call for asbestos-free materials does not mean that ship-builders must stop using asbestos products. Many ship-sets of asbestos containing products, purchased to earlier versions of the product specification had already been bought and in some cases installed. Tens of thousands of pounds of asbestos products remained in warehouses, aboard ships, and in shipyards, in active use. With no positive action by the Navy, many additional years would pass before the asbestos products were exhausted. Although, in some cases, separate action by some Navy components resulted in the asbestos-free products being used prior to 1973 or 1974, the overall Navy policy prohibiting the use of such material could not be promulgated until we had some assurance that it could be followed. By 1975, asbestos-free materials were generally available to all Navy***

agencies and the no-asbestos policy statement, NAVSEAINST 5100.2 of 24 October 1975 issued."

Admiral Bigley further noted that although ship purchase contract specifications were changed for some ship classes in 1971, the change for all ships classes was not accomplished until later:

". . . Ships well under construction and already insulated at that time continued through to delivery as late as May 1978 with asbestos insulation. Consequently some ships were delivered with asbestos thermal insulation since 1973."

Admiral Bigley (1979) further addressed the removal of asbestos from existing shipboard installations:

"Regarding removal of all asbestos aboard Naval vessels, Navy policy has required replacement of asbestos insulation with substitute material when insulated equipment and machinery are repaired. Recently, this policy has been modified to require, in addition, selective replacement of asbestos insulation in those high-maintenance areas where repairs may be anticipated during the subsequent operating cycle of the vessel. During the next five years, implementation of this policy will result in the removal of all shipboard thermal asbestos except that 30 to 50 percent which is normally untouched during the life of the ship.

The concept of a one-time total asbestos removal on all ships has been-under intensive review to determine if such a policy revision is technically and economically feasible. Initial analysis does not justify such a policy change. While there is no intention to conduct a trade-off of human health for maintenance and repair funds, the funds involved are substantial. As indicated above, the estimated cost to reinsulate just three classes of ships (frigates, destroyers, and submarines) is $965.13 million. It is reasonable to assume that the estimated cost for total asbestos replacement in 'all ships will approach two billion dollars. The true cost is likely to increase significantly because of delay and disruption effects, increased overhead charges due to longer overhauls, and increased shipyard manning to handle the added work. This enormous cost is not the only reason that the Navy has not adopted a one-time total asbestos removal policy. Other factors which support the present policy are the following:

a. During the life of a ship, 30 to 50 percent of the total asbestos insulation will never be touched except for painting or making minor repairs to the lagging cover material. Measurements show that operating ships equipped with asbestos insulation have airborne asbestos levels at or below 0.1 fibers per cubic centimeter. This value

is comparable to the ambient level reported for the City of Philadelphia by Dr. Irving Selikoff, a well known asbestos expert. Therefore, on the basis of existing information, a properly maintained and operating ship should not present an active asbestos hazard.

b. The Navy requires and enforces stringent asbestos work standards which control exposure of workers to asbestos dust during ship repair. By minimizing the amount of asbestos work done, the potential exposure, residual dust, and overhaul cost are minimized.

c. Fibrous glass and calcium silicate products are being used as asbestos replacements. The National Institute for Occupational Safety and Health has recommended controls for fibrous glass work that are nearly identical to the controls now imposed for asbestos work. It seems reasonable to assume that if the Institute recommends nearly identical controls for two similar substances, comparable hazards could be known or suspected. Therefore, it is not at all certain that wholesale replacement of asbestos products gains any medical advantage at all.

d. Despite the enormous cost, replacement of asbestos thermal insulation in ships will not eliminate asbestos exposure of civilian and military Navy

personnel. According to the National Institute for Occupational Safety and Health, asbestos dust is everywhere. Low but easily measurable levels of airborne asbestos dust are found in the air of cities throughout the country, much of it generated by automotive brake and clutch linings. Asbestos is used in so many products that most of the U. S. populace unknowingly encounters it daily."

61. As discussed previously, the potential exposure of active duty Sailors to significant levels of asbestos fibers was only recognized under unusual conditions – such as periods in which ships were "in the yard" for overhaul or undergoing significant maintenance or repair (Wynkoop, 1947). Similarly, based on the state-of-the-art in industrial hygiene and occupational medicine available at the time, the duties that were thought to put civilian shipyard workers at risk for potentially significant asbestos inhalation exposures were largely limited to prolonged installation and removal projects by workers in the pipecovering trade (insulators). The Navy had both a well-based and well-established program for the control of the hazards of asbestos based upon the state-of-the-art, and, in consideration of its responsibility for national defense, made appropriate and informed decisions to specify and use asbestos for Navy ships. These programs were appropriately delivered through the Commanding Officers of each Naval activity – the individuals with ultimate Navy authority and responsibility. There was not an equipment manufacturer, nor a vendor, in a position to offer better advice to the US Navy

before the enactment of the Occupational Safety and Health Act in 1970. And after 1970, and through the present time, the Navy's occupational health program continues to reflect the state-of-the-art in national safety and health policy and procedures, and to maintain readiness for national defense.

DISCUSSION AND ANALYSIS OF RISK-BALANCING BY THE NAVY RELATIVE TO ASBESTOS EXPOSURES AND THE HEALTH OF NAVY DEPARTMENT PERSONNEL

62. The Navy weighed its knowledge of the hazards created by the use of asbestos containing materials against the vital operational benefits provided by its use. The Navy controlled asbestos exposure consistent with the then current state of accepted scientific and medical knowledge balanced by needs for national defense throughout the various periods of its use. The Navy's asbestos control program, at all times discussed above, was multifaceted and complex, and included hazardous process identification, engineering controls, use of alternative materials in accordance with Navy specifications and contract requirements, personal protective equipment, training and education, and medical surveillance – all when indicated by the level of exposure to airborne asbestos fibers.

63. In all, it was the Navy (or analogously Coast Guard and Coast Guard personnel), with Congressionally-designated authority for operating and controlling the shipboard and activity/facility environments, workplaces, and types of materials, methods, and tasks to which Navy Sailors were assigned and where civilian personnel worked. The Navy accepted this role and responsibility in the performance of its

mission. The Navy established and followed an occupational health program that protected its personnel – its most vital resource – so that they could carry out their tasks in support of the Navy's mission. Without its Sailors, a ship would be nothing more than an object either moored to a pier or floating aimlessly upon the sea; without its ships – and its Sailors – there would be no Navy. The Navy's civil service personnel were no less expendable as essential participants in maintaining the Navy's state of readiness.

64. As discussed above, Sailors in the engineering ratings "steam the ship" by operating the equipment. While it is certainly true that maintenance and minor repairs are performed, the vast majority of time is spent operating the various steam-driven equipment. The major units of propulsion machinery onboard a Navy warship (along with their appurtenances and associated equipment like piping and valves) are specifically designed to be highly reliable pieces of equipment which require nominal maintenance during normal operation. During the periods relevant to this report, the types of tasks which were routinely performed by shipboard personnel while operating this equipment were not considered by Navy occupational health professionals to result in exposure to asbestos fibers which would exceed the allowable occupational exposure level; they were not considered to be hazardous tasks – at least with respect to asbestos. To the extent Sailors experienced any exposures to asbestos-containing materials associated with equipment during their normal duties onboard ship, except in exceptional circumstances, these would typically have been medically and clinically insignificant and well below

the allowable permissible exposure limits of the period. The major contribution to meaningful asbestos concentrations onboard a Navy ship of this era was from amosite asbestos fibers released from friable thermal insulation used on piping and other steam systems throughout the ship. However, even these airborne fiber levels were well below the accepted exposure levels of the period and not considered to be hazardous to personnel.

65. Navy and civilian personnel working onboard ships and other vessels obviously worked around various equipment ranging in size from the very small – to the enormous. However, except in exceptional circumstances, Navy Sailors operating and maintaining equipment while performing accepted work practices would not typically have been exposed to airborne levels of asbestos fibers arising from gaskets, packings, or insulation on any piece of equipment which exceeded the accepted occupational exposure levels at the time. If exposure to airborne asbestos fibers was expected to exceed the accepted occupational exposure level at any given period in time, both during the pre-OSHA and post-OSHA periods, personal protection and other industrial hygiene controls were required. It should be noted that the equipment used in a Navy ship's machinery spaces – like turbines, boilers, pumps, valves, etc. – are typically shipped and installed without external thermal insulation. If thermal insulation was required by Navy specifications, the external insulation was provided and installed by the shipbuilder or repair activity after initial installation.

66. The presence and content of asbestos in thermal insulation, as well as gaskets and packings and

other materials used in naval construction, is variable. Unless qualitatively and quantitatively determined in a scientific manner, the presence, type, and concentration of asbestos cannot be determined in either the material or in the air. From the industrial hygiene standpoint of controlling potential hazardous inhalation exposure to asbestos, it may be assumed that much of the thermal insulation and other materials, such as gaskets and packings, used in the construction and maintenance of naval vessels contained asbestos roughly during the era of the 1940s through the 1960s; however, only proper evaluation and determination by trained and qualified individuals can scientifically and conclusively make the determination. Without such evaluation, it cannot be known whether and to what extent the products, and the "dust" purportedly identified by witnesses not trained in applicable industrial hygiene methods, actually contained asbestos.

67. The Navy's total occupational health program operated within the Navy organizational structure (chain of command) and was designed to maintain functionality in the completion of the Navy's mission while controlling untoward exposure to airborne asbestos fibers to all Naval and civilian personnel. The ability of the Navy to operate and fulfill its mission rests upon many critical elements, the greatest of which are its Sailors. However, real world considerations such as funding, political and other current events, and natural and man–made catastrophes also impact senior Navy leadership's final decision in all matters. By the very nature of the Navy's mission, it is a combatant force and the Navy's leaders ("war fighters") must thoughtfully elect to place Sailors "in

harm's way" to protect the country and its vital interests – as directed by President. Although these actions may result in casualties or death of Navy personnel, these types of decisions must be made for the good of our Country – its daily existence, its defense, and its survival. The Navy's occupational health program, including its asbestos exposure control program for over the vast majority of the 20th Century, was directed at maintaining a fit and healthy fighting force in support of accomplishing the Navy's mission and maintaining its combatant and support vessels, aircraft, missiles and other essential equipment – as well as providing essential occupational health resources for its civilian personnel.

68. As the occupational exposure level for exposure to airborne asbestos fibers decreased over the period of the late 1960s, and more so in the early 1970s under OSHA, the Navy and private, regulated shipyards and other industries further increased their vigilance for the control of exposure and instituted further industrial hygiene controls including: the substitution of asbestos in thermal insulation where possible; use of products containing lower amounts of friable asbestos; increased training; control of potential exposure to asbestos fibers of non-involved or unprotected personnel; posting of a warning; and the designation and education of individuals specially trained and equipped to handle asbestos in order to minimize the release of asbestos fibers. The use of asbestos-containing products has continuously decreased since the late 1960s and the potential for direct and background exposure has concomitantly decreased. The increased control of potential exposure to respirable asbestos fi-

bers was performed by the Navy while it still maintained a fighting force and provided for the Country's national defense. In addition to the post-OSHA regulations, as a matter of practicality and economic necessity, regulated industries also followed the trend of removing and replacing, or encapsulating/enclosing, potentially friable asbestos sources and materials. After the late 1960s, the composition of any thermal insulation, construction, or other previously known asbestos- containing product cannot be assumed.

69. As described above, the expertise of the Navy, with respect to the specification and use of asbestos, and the health hazards associated with its use onboard Navy vessels, far exceeded any information that possibly could have been provided by an equipment manufacturer. Additionally, the boiler, turbine, electrical, and auxiliary equipment manufacturers have absolutely no authority, responsibility, or control over the operating workplace or personnel – both essential aspects of hazard communication. Concomitant with the huge increase in shipbuilding during World War II, the Navy developed a robust and multifaceted occupational health program which addressed many health risks. Over a quarter-of-a-century before the enactment of the Occupational Safety and Health Act of 1970 (US Cong, 1970; PL 91-596), the Navy had an asbestos control program in place which contained most of what was later required for non-military workplaces under this first national legislation controlling occupational exposure to asbestos. The Navy's program far exceeded the mere provision of a warning placard or note in an instruction or operation manual. The major aspects of the Navy asbestos control program existed before OSHA and have continued,

with modifications, to remain consistent with the evolving state-of-the-art knowledge and statutory requirements of OSHA. The Navy's early program included the:

(1) adoption of an occupational exposure level (five million particle per cubic foot (5 MPPCF);

(2) establishment of the methodology to evaluate exposures;

(3) training and equipping an occupational health team with state-of-the-art knowledge and equipment;

(4) development and specification of engineering and administrative controls where required;

(5) establishment of a proactive medical surveillance program applying SOTA monitoring techniques incorporating pulmonary function testing to detect early changes with greater sensitivity than using chest radiographs alone (chest radiographs reveal later-developing changes);

(6) the wearing of approved respiratory protection for tasks performed when exposure levels were expected to exceed the accepted, "time-weighted average" concentration;

(7) recordkeeping; and

(8) training (hazard awareness) – and later more requirements were added consistent with the developing state-of-the-art and Federal and Navy requirements.

70. The Navy controlled exposure to asbestos consistent with the then current state of accepted scientific and medical knowledge balanced by needs for national defense. Sailors did not have the option to avoid exposure to asbestos-containing products or environments in which asbestos was used while on active duty. Certainly, Navy vessels built and/or overhauled in the 1940s through the 1970s often contained large amounts of asbestos which covered steam-driven equipment and thousands of feet of thermal-insulated pipes. These insulated lines traversed the entire vessel including non-engineering work spaces, as well as eating and berthing spaces.

71. In light of the Navy's knowledge regarding the potential asbestos-related health hazards from exposure since the 1920s (well before the large increase in specification by Navy designers, architects, and engineers), and the known military and technologic benefits or advantages afforded by the use of asbestos as thermal insulation and in other applications, the Navy made an informed decision to use asbestos-containing products. The Navy was fully cognizant of potential health hazards when it specified use of asbestos in applications critical to national defense and the conduct of war. To insure that the health of military and civilian personnel was maintained, the Navy established a sound, premier state-of-the-art occupational health program to control the recognized, potential health hazard.

72. To carry the concept involving the offering of a written warning by an equipment manufacturer further, as the Navy had determined what an "acceptable asbestos exposure" was, the Navy would not, nor could

not, allow each sailor to make an additional determination of what constituted an acceptable exposure on an individual basis. This is not only true for determining whether or not one would accept an asbestos exposure, but also all of the dozens of other daily potentially hazardous exposures (including to an armed enemy) that confront personnel. Navy specifications or instructions, as well as my decades of experience as an officer rising to the rank of Navy Captain, do not support the notion that manufacturers of equipment were free to provide additional warning information about hazards associated with products – especially those (like insulation) that they typically neither manufactured nor supplied.

73. Based upon review of many documents regarding the Navy's hazard communication program, and based on my career experiences as an Industrial Hygiene Officer and a physician in the Navy dating back to 1972, and personal knowledge of the Navy's hazard communication program and Naval practices generally, it is indisputable that uniformity and standardization of any communication, and in particular safety information, are crucial to the operation of the Navy. The Navy had a sound, occupational health and safety program based upon its requirements and conducted in accordance with Navy regulations, instructions, and operational necessities. Simply, the Navy could not operate if various personnel were trained differently and received additional, inconsistent information from different manufacturers.

74. For example, SECNAV Instruction 5100.8 ("Uniform Labeling Program - Navy, 26 September 1956) – which is an internal Navy directive from the Secretary of the Navy directing Navy personnel, not

manufacturers of material or equipment, of the manner in which to carry out their obligations – Para.1 states: ***"The purpose of this Instruction is to standardize labeling requirements for hazardous chemical products during usage..."***

75. Further to this goal of standardization, the Navy itself undertook the responsibility of developing, promulgating, and enforcing safety precautions for equipment maintenance. Indeed, the instructional manual provided to all new Navy Sailors (Bluejackets' Manual, 1965) provided:

> ***"Your CO has been assigned safety as one of the functions of his command. He, your XO, your department head, division officer and petty officers are required to see to it that their men are instructed in appropriate safety precautions. These officers are required to make sure that each of their men know and practice safety precautions.***
>
> . . .
>
> ***Navy Bureaus and Offices study the equipment for which they are responsible and then publicize the safety precautions to be followed. Safety precautions that are instrumental in avoiding preventable accidents and maintaining a healthy work environment have been gathered into a publication entitled 'Safety Precautions, Department of the Navy.'"***

These Navy safety instructions referenced (Department of the Navy Safety Precautions, NAVSO P–2455, 1965) in this Bluejackets' Manual specifically set forth the Navy's official procedures for asbestos safety:

"Exposure to asbestos dust is usually encountered in the installation, repair, and removal of insulating pipe covering used principally aboard ship. The following precautions should be taken in any dust making operations involving asbestos products:

a. Provide permanent general ventilation in areas where dust producing operations are usually performed.

b. Install exhaust hoods over saws and other dust making machine tools.

c. Require workers to wear dust respirators where dusty operations cannot be adequately ventilated.

d. Use industrial vacuum cleaners in lieu of dry sweeping of floors and other surfaces."

As discussed previously, as the state-of-the-art of asbestos hazard awareness developed within the medical and scientific community, these procedures were repeatedly superseded by ever more sophisticated Navy asbestos safety policies (NAVSHIPSINST 5100.26: "Control of Asbestos Hazards", COMNAVSHIPSYSCOM, 1971; Naval Ships Technical Manual, Ch. 9390: "Thermal Insulation, Safety Precautions for Asbestos," 1972; OPNAVINST 5100.19: "Safety Precautions for Forces Afloat, CNO, 1973; COMNAVSEASYSCOM, 1975).

76. In contrast, the Navy promulgated detailed specifications regarding the content of equipment

manufacturer technical manuals – with specific examples of safety instructions that should be included (Military Specification – Technical Manuals for Mechanical and Electrical Equipment, MIL-M-15071 (SHIPS)). Similarly, the Navy promulgated detailed specifications for the form and content of information plates to be displayed on shipboard equipment (Military Specification – Identification Plates, Information Plates and Marking Information for Identification of Electrical, Electronic, and Mechanical Equipment, MIL-1-15024 (Ships). These two specifications specifically governing the content of written materials – including safety instructions dealing with operation and maintenance – to be provided by military equipment vendors are both completely silent regarding asbestos. However, such countless equipment manuals, identification/ information/markings provided under contract terms by numerous manufacturers were reviewed, accepted, and used by the Navy for decades. It is obvious that these were not the methods nor instruments chosen by the Navy to control exposure to airborne asbestos fibers—this was a health-related matter addressed and controlled via another preferred route.

77. Indeed, any additional warning about the hazards of asbestos by an equipment manufacturer – beyond those already provided and enforced by the Navy – would have been only partial in scope, as well as inherently redundant and possibly inconsistent with the Navy's own position and training. In the heat of battle, there is simply no time to be interpreting inconsistent hazard labels.

78. It has been my understanding, which has been supported by my experience, that literally all Navy

sailors serving on ships in the WWII era and through the late 1960s knew and/or assumed that the high temperature thermal insulation used on naval steam system pipes and equipment contained "asbestos". The exact type and composition of the thermal insulation may not have been known, but the use of asbestos for such application was so universal that identification of external thermal insulation on such hot steam system lines and equipment that the insulation was usually assumed to be "asbestos" – even in instances where it was replaced with fibrous glass, mineral wool, or other non-asbestos materials, or used as a minor component in an "85% Mag" product (85% magnesia: 15% "asbestos"). This was still the practice when I was commissioned in 1972. As a fundamental aspect of Navy training and practice, dust control and a high level of general cleanliness, even in the engineering spaces, were routinely maintained as part of the standard Navy shipboard environment—spaces were kept "shipshape".

79. At most, an equipment manufacturer could merely have told personnel to follow the Navy's own mandates for handling asbestos. Potentially redundant information is not informative, and diverts attention from hazards inherent in the equipment, and would certainly become obsolete. For example, the life expectancy of propulsion equipment onboard ship is many years, while military specifications and program emphasis (such as the Navy's asbestos hazard communication program) change much more frequently and have evolved over the years to keep pace with scientific developments and changes in materials. Static warnings about asbestos hazards provided with

equipment intended to operate for decades would have been outdated and inaccurate almost immediately.

80. There are additional, sound reasons why the Navy did not want unsolicited and potentially inconsistent warning information from equipment manufacturers regarding asbestos insulation (or any other product) which was provided by other vendors or contractors. If every equipment manufacturer (and conceivably even the pipe and structural steel manufacturers) provided its own warning about asbestos insulation that might be used on or around its product, inconsistent warnings from these various sources would certainly have resulted. And, keep in mind, many other hazardous substances (e.g. boiler feed water chemicals, fuels, solvents, heavy metals) are used in conjunction with the multitudes of equipment on a ship. If each was to warn about all the possible substances that might be used on or around its equipment, sailors would quickly become inundated with inconsistent information on a myriad of substances.

81. Moreover, materials like external thermal insulation are periodically removed and replaced, and some types of insulation used by the Navy on equipment were non-asbestos (e.g., fiberglass blankets). Warning about asbestos on equipment where insulation – initially asbestos in the 1940s or 50s – was later replaced with non-asbestos insulation – in the 1960s or 70s – would simply be wrong. Military specifications for thermal insulation over time allowed an assortment of materials – as determined by a number of critical design and materiel availability parameters. As early as 1952, MIL–I–16411 A addressed a non–asbestos thermal insulation felt that was suitable for use on steam turbines and other machinery and

equipment operating at temperatures to 1,200°F – if selected by the naval design engineers and builders. After delivery of the equipment, how would the equipment supplier know what insulation material would be used in future repairs, overhauls, and conversions made one, two, or more decades in the future?

82. MIL–M–15071D, para. 3.3.1 makes it clear that equipment manufacturers' manuals must first be approved by the Bureau of Ships and ***the "manual shall not be modified without approval of the Bureau of Ships."*** Thus the Navy and/or its agents reviewed and approved the content of all equipment vendor manuals. In all cases, it was the Navy that exercised final discretion over what warnings to provide, or not provide, in equipment technical manuals. Moreover, it cautions: ***"Notes, cautions, and warnings should be used to emphasize important critical instructions. The use should be as sparing as is consistent with real need."*** This specification applies to risks inherent in the operation of the equipment; unsolicited and gratuitous warnings about the possible use of materials made and sold by others do not comport with this specification. The concepts of "safe", "hazardous", and "toxicity" have changed over the past decades. Specifically, as late as 1964, the American College of Chest Physicians in its treatise on "Asbestosis" noted: ***"Asbestos is not currently considered a toxic substance since it does not produce systemic poisoning."***

83. Lastly, but importantly, equipment manufacturers are not subject matter experts regarding the health effects or industrial hygiene controls associated with the use of asbestos-containing insulation materials in naval applications. It is unreasonable to

speculate that the Navy would have accepted "helpful comments" from a vendor or equipment manufacturer concerning a material or substance provided by another vendor or supplier in which it was not a subject matter expert. And in any event, the Navy already had this specific expertise, and more – and understood its own basis for specifying asbestos-containing products onboard ship. The Navy already had a robust and encompassing occupational health program, working in concert with the Navy's operational, engineering, and maintenance and repair facilities, that far exceeded just the mere labeling of a material. This program included aspects appropriate for the degree of recognized hazard at various times including training, engineering controls, medical examinations, provision of personal protective equipment, and the use of alternative products when possible. It is thus not surprising that the Navy, with its inherent authority used its discretion, consistently reviewed and approved manuals for thousands of pieces of shipboard equipment without redundant – and potentially inaccurate and conflicting – "asbestos warnings".

84. The naval or military setting is unique and distinct, and although management structure is generally similar, the command hierarchy of rank is well-defined and the authority of the Commanding Officer approaches absolute. This authority is based in Federal statute, as well as in Navy Regulations and Instructions. Over time, there have been evolutionary changes in these to incorporate changing societal values, but the authority of the individual in command remains constant. When routine "orders" are given, prompt and appropriate response is expected. The failure to obey a lawful order is a punishable offense,

and depending upon the situation (war time, national emergency, misconduct), the punishment can be severe. Individual freedoms that are common to civilians are not as universally applied to military members, or even civilians working onboard Navy ships in Federal and private shipyards. Civil liberties indeed exist, but they are tempered to the strict Uniform Code of Military Justice (UCMJ) and the requirements for national security. To suggest that a government contractor supplying equipment used in a critical shipboard propulsion system had the autonomy to place whatever instructions it wanted onboard Navy warships, or other naval vessels – as simply as commercial manufacturers might add a label to a consumer product – is misleading and false.

PRIVATE EMPLOYER RESPONSIBILITIES

85. Prior to the enactment of the Occupational Safety and Health Act of 1970, the universally- recognized occupational exposure level in the United States for airborne asbestos particles (not fibers) was 5 million particles per cubic foot (5 MPPCF) or equivalent to approximately 30 fibers per cubic centimeter (30 f/cc). This level had been previously widely-accepted by health professionals and regulators in the United States since the late 1930s.

86. When OSHA first regulated asbestos in 1971 under authority of section 6(a) of the Occupational Safety and Health Act, it also adopted this value which existed as the Federal standard for asbestos under the Walsh–Healey Public Contracts Act. On May 29, 1971, the initial OSHA Permissible Exposure Limit (PEL) of 12 fibers per milliliter (or cubic centimeter ("12 f/cc" greater than 5 microns in length by phase contrast magnification)), or "equivalent" of 2

million particles per cubic foot ("2 MPPCF" by impinger samples counted by light-field techniques) was published. An "Emergency Temporary Standard (ETS)" for exposure to "asbestos dust" was promulgated on December 7, 1971, which reduced this value to 5 f/cc (with a 10 f/cc ceiling limit not to exceed 15 minutes in 1 hour for up to 5 hours/day). This ETS was in response to a petition by the Industrial Union Department of the American Federal of Labor-Congress of Industrial Organizations (AFL-CIO). The major shipyard workers' unions were affiliates of the AFL–CIO.

87. In June 1972, OSHA promulgated these limits in a final rule: "Standard for Exposure to Asbestos Dust" (Dol, 1972). The control of asbestos exposure to US workers was one of the five "Target Health Hazards" established under OSHA: (Dol, 1972b)

> ***"Focusing upon the need to create healthful working conditions, the Occupational Safety and Health Administration in January 1972, initiated the Target Health Hazards Program. The emphasis is on five hazardous workplace substances:***
>
> 1. ***ASBESTOS***
> 2. ***LEAD***
> 3. ***SILICA***
> 4. ***COTTON DUST***
> 5. ***CARBON MONOXIDE***
>
> [EMPHASIS ADDED]
>
> ***WHAT ARE APPROVED LEVELS? OSHA's permissible level is 5 fibers per milliliter greater than 5 microns in length for an***

eight-hour, time-weighted average airborne concentration. This may be increased to 10 such fibers per milliliter for no more than 15 minutes per hour, up to five hours per eight-hour day. Imminent danger situations are generally not applicable. Any exposure greater than permissible levels for unprotected or improperly protected workers is considered a serious violation."

88. In July, 1976, the OSHA PEL for asbestos was decreased from 5.0 f/cc to 2.0 f/cc; the ceiling concentration remained the same at 10 f/cc. At that point in time, even with a lower Permissible Exposure Limit, operators of equipment in typical shipboard settings and those operating and maintaining equipment which incorporated bound or non-friable asbestos materials were not, under normal working conditions, expected to be at risk of exposure to asbestos dust levels in excess of the existing Permissible Exposure Limit. These Federally-mandated permissible exposure limits (and corresponding Navy-directed occupational exposure limits), as well as all of the requirements for an "asbestos program" were in effect throughout the United States – and, of course, in a unionized shipyard facilities. In 1986, with considerable "fanfare", OSHA further reduced the Permissible Exposure Limit to one-tenth of its previous value – the Permissible Exposure Limit became 0.2 f/cc. This statutory limit remained in effect until 1994, when the Permissible Exposure Limit was further reduced to its present value of 01. f/cc. During the development and evolution of the "Asbestos Standard" over time, the National Institute for Occupational Safety and Health

(NIOSH) provided the scientific and medical "technical" support to OSHA; NIOSH was staffed with commissioned officers and civilians working for the Public Health Service. To the extent that specific working conditions at a specific workplace did create a risk based upon the airborne concentration of asbestos fibers and other use and exposure parameters, the Navy, as well as Federal laws, initially the WHPCA and "Safety and Health Regulations for Ship Repairing", and later OSHA, the duty of educating, protecting, and warning the worker fell explicitly upon the employer (or the Commanding Officer in the Navy or Coast Guard) – as well as the manufacturers of the asbestos materials at issue.

89. Additionally, the new environmental release and disposal requirements under the Environmental Protection Agency's (EPA) "National Emission Standard for Hazardous Air Pollutants for Asbestos (Asbestos NESHAP)" in 1973 also had to be concomitantly fulfilled. (US Congress, 1970b; EPA, 1973) As discussed elsewhere in this report, the evolving "Asbestos Standard" and other statutory requirements enacted under the Occupational Safety and Health Act applied to the Navy and the Coast Guard via a series of Executive Orders; they were implemented by a series of specific Departmental and service instructions which were carried out via the Commander/ Commanding Officer and chain-of-command. Processes and conditions which were "military unique" were specifically excluded; however, general Navy and private shipyard operations were directed to be consistent with OSHA and EPA requirements as they pertained to the handling, use, management, storage, and disposal of asbestos-containing materials.

90. Because of the risk created from having a large number of workers and a large amount of asbestos-containing materials present, civilian shipyards were specifically-targeted industries for the OSHA and EPA regulators regarding all aspects of asbestos use, handing, and disposal. Additionally, inspecting officials of the US Coast Guard, as well as privately employed individuals working in shipyards and onboard ships during construction, repair, or overhaul, were subject to the provisions of the Occupational Safety and Health Act. OSHA inspectors could go onboard vessels for inspections, but they were equally concerned about all shipyard safety and health conditions.

91. Any safety and health program must surely "start at the top" and include all levels of employees including management. The Navy's (and all US Governmental Departments' and Agencies') overarching Safety and Health Program includes and involves all levels of personnel from the highest levels of command (management) and supervision to the "deckplates" – the entry-level and unskilled enlisted and civilian personnel in the Navy Department.

92. As discussed throughout this report, the Navy had its own occupational health program which started before– well before the Occupational Safety and Health Act of 1970 (OSHA) – and continues to this date operating independently under Department of Defense Directives now as the Navy's Safety and Occupational Health Program. The Navy's program to control asbestos has always been the "State-of-the-Art". As discussed previously, prior to the enactment of OSHA in 1970 and its statutory implementation in 1971, employment conditions at private facilities,

such as shipyards and other industrial sites, were regulated under state and local laws, and, where applicable, Federal legislation ("Minimum Requirements" (1942)– updated for shipyards through the periodically revised and amended requirements of the Walsh-Healey Public Contracts Act (1936) and the "Safety and Health Regulations for Ship Repairing" (Dol, 1960)). The "Safety and Health Regulations for Ship Repairing" enacted in 1960 (Dol, 1960) state:

> ***"... safety and health regulations that have been determined by the Secretary of Labor to be reasonably necessary to protect the life, health and safety of employees engaged in longshoring, ship repairing, and related employments covered by Section 41 of the Longshoremen's and Harbor Workers' Compensation Act, as amended."***

These regulations were mandatory with respect to employers. Similarly, the numerous asbestos control requirements and health program aspects under OSHA were specifically directed to the employer and the workplace – not equipment manufacturers or suppliers. The scope of the OSHA asbestos regulations for employers was vast and the requirements were very specific. In a manner similar to the position accepted and taken by the Government, the employer, or controller of the workplace, had full responsibility for the control of occupational health hazards arising in or from the workplace. Under OSHA, it is the employer that has responsibility for providing a workplace that is free from recognized hazards (US Congress, 1970) and following the asbestos dust standards (Dol, 1972). Each employee also had responsibilities.

"(a) Each employer–

(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

(2) shall comply with occupational safety and health standards promulgated under this Act.

(b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct." [EMPHASIS ADDED]

OSHA was enacted:

"To assure safe and healthful working conditions for working men and women; by authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health; and for other purposes."

93. It was the employer, not the manufacturer of equipment used in a workplace, who was given the responsibility to control exposure to respirable asbestos fibers. Any worker's excessive occupational exposure after the enactment of OSHA was a likely result of a failure of the employer's specifically OSHA-mandated

comprehensive asbestos control program (or the Navy's program), and not from any purported lack of a warning by equipment manufacturers and suppliers.

CONCLUSIONS

94. As discussed throughout this report, the US Navy had a longstanding program to prevent excessive exposure to airborne asbestos fibers based upon the best available knowledge – it was the state–of–the–art. This program was initially directed at preventing the only known illness directly caused by excessive exposure to inhaled asbestos fibers – the clinical disease called "asbestosis". The association between this clinical disease "asbestosis" (not merely "exposure to asbestos") and lung cancer was not generally accepted until Doll's published work in 1955. The disease "mesothelioma" was not associated with different exposure conditions to one type of asbestos (crocidolite) until Wagner's publication in 1960. Until the middle of the 1960s, the development of mesothelioma was also associated only with the presence of asbestosis. Lastly, it was not until 1972 that exposure to amosite asbestos was demonstrated to cause mesothelioma by Selikoff and his coworkers. The Government's initial program was directed at preventing lung fibrosis – asbestosis-the recognized precursor of lung cancer and mesothelioma during that period. That was the state-of-the-art practiced throughout the Nation and the world at that time. After the late 1960s, the Navy and the remainder of the Federal Government paralleled the statutory requirements of the Occupational Safety and Health Act – and in many instances the Navy had more strict requirements which had to be met by the "operational Navy".

95. Throughout the time periods discussed herein – but especially for all occupational exposures after the enactment of the Occupational Safety and Health Act of 1970 – the employer and controller of the workplace was required to have an effective program for the control of exposure to regulated asbestos-containing materials. It was the employer and the employee – not the equipment manufacturer, that were responsible for safety and health in the workplace. For realistic delivery of OSHA–mandated workplace occupational safety and health programs at industrial facilities, all levels of management and supervision were involved. The Navy not only closely followed this mandate, it stood as a model for control of exposure and modification of the workplace. The Navy's "first-level supervisors" were the Chiefs and senior Petty Officers, and they were extremely important in monitoring the day-to-day adherence to mandatory safety and health regulations – while accomplishing the Navy's essential mission in National defense. The control of occupational exposure to asbestos was one of the five national "Target Health Hazards" established by OSHA in 1972. It was the Navy's "Number One" occupational safety and health program – starting in early 1971 with a redoubling of prior efforts. Environmental controls dealing with the content, labeling, handling, and disposal of asbestos-containing materials were also established under the Environmental Protection Agency (USEPA, 1973, 1975, 1976). The operational Navy also followed these requirements.

96. The presence and content of asbestos in various materials, including thermal insulation, gaskets, packings, and other materials used in naval, marine,

and industrial applications, were variable, but generally decreasing over the period of the 1950s through the 1970s. Additionally, the friability of these materials varied considerably. Unless a material is qualitatively and quantitatively analyzed in a scientific manner, the presence, type, and concentration of asbestos cannot be determined in either the material or in the air. The release of friable asbestos fibers into the air can only be determined through sampling and analysis of air samples. The mere "observation" that one can see a large particle of dust does not confirm that respirable-size asbestos fibers of any significant concentration would be inhaled. Visible dust is not necessarily "respirable" dust – and "respirable" dust is not necessarily all asbestos. Duration and frequency of exposures are also important in assessing asbestos exposure. From the industrial hygiene standpoint of controlling potential hazardous inhalation exposure to asbestos, it may be assumed that much of the thermal insulation and other materials, such as gaskets and packings, used in the construction and maintenance of naval vessels, as well as industrial facilities, contained asbestos during the era of the 1940s through the mid-1970s – and later; however, only proper analysis and determination by trained and qualified individuals are scientifically conclusive. Without such evaluation, it cannot be known whether, and to what extent, the products and the "dust", purportedly identified by individuals not trained and not utilizing applicable industrial hygiene methods, actually contained asbestos.

97. Based upon my decades of experience as an industrial hygienist and physician in the Navy, as well as the available scientific and medical literature and

known incidence of former Navy personnel with asbestos-related diseases, it can be stated with some certainty that personnel working in Naval and private shipyards and onboard Navy ships during the 1940s through the 1960s, and sometimes even into the 1970s, experienced what is today understood to be clinically meaningful exposures to asbestos dust – from both the general background level onboard a Navy vessel of the era, as well as when performing tasks on thermally-insulated surfaces. During this time period, the scientific and medical data indicated that controlling inhalation of asbestos fibers to levels below those which caused asbestosis effectively guarded personnel from the subsequent development of asbestos-related cancers. Typical shipboard exposure levels of this era were not considered to be excessive or causally involved with the development of asbestos-related lung disease by the contemporary occupational health professionals. The largest, and most significant, source of friable asbestos fibers from thermally-insulated surfaces onboard ships of those periods would be the pipecovering on the thousands of feet – literally miles – of piping. It is practically impossible to make any other definitive statement regarding the specific source(s) of a particular individual's significant exposures to respirable asbestos fibers onboard ship. More importantly, using the ungrounded and unsubstantiated assumption that each and every fiber contributes to the development of a cancer and actually causes the cancer is – from a scientific standpoint – meritless. The probabilistic "cause" in the development of a cancer, such as malignant mesothelioma, is based upon the source(s) that meaningfully contribute to an individual's effective "dose" – the dose is the amount

which contributes to the risk that the "causal fiber" will reach the target cell and cause uncontrolled or unabated cellular changes which actually lead to the cancer. In retrospect, it must be realized that there were an extremely huge number of these individual asbestos fibers in the air using the scientifically-based, recommended exposure values developed and accepted by the scientific and medical communities, and used by the Navy and numerous other federal agencies and states during these various periods. The initial occupational exposure level of 5 MPPCF (30f/cc) equates to 1,059,300,000 asbestos fibers in each cubic meter of inhaled air (5 MPPCF x 6f/MPPCF x 35.31 cu ft/cu m); this equates to over 8 billion fibers inhaled daily (x 8 cu m/day max inhaled) by an individual before the enactment of the Occupational Safety and Health Act in 1970. The currently mandated OSHA Permissible Exposure Level of 0.1 f/cc (greater than 5 microns in length) for asbestos has been in effect since 1994. Under this PEL, there can still be up to 100,000 such sized fibers in each cubic meter inhaled, and up to 800,000 fibers can inhaled each day. Identifying the likely source of the causal fiber was, and remains, difficult and practically impossible. Also, it must be noted that not every asbestos fiber in an asbestos-containing material is released (friable) or inhaled (breathed in). Furthermore, not every fiber which is inhaled is "respirable" (brought into the lungs) and retained in the body, and finally reaches the site where the tumor develops. If each and every asbestos fiber contributed to the development of malignant mesothelioma, then one would expect the presence of many individual tumors arising from the enormous number of inhaled fibers. Generally, in the vast majority of cases,

to the extent there exists any identifiable source of significant exposure to respirable airborne asbestos fibers onboard any ship of an era, including the general ship-wide background levels, the external thermal insulation on the piping would be that source – and by far the largest amount of friable asbestos material used onboard ships of the corresponding era.

98. Federal Department s and Agencies, such as the Navy, Coast Guard, Public Health Service, and Labor, had total control over its hazard communication program at all times relevant to this discussion, including control over the content – and methods of delivery – of safety instructions and warning provided to personnel. The Government exercised its discretion in this respect by balancing the priorities of operational necessity, the health and safety of personnel, as well as other practical and logistical considerations. The Navy, in particular, itself implemented a state-of-the-art occupational safety and health safety program that included asbestos. It thus chose to provide consistent, uniform instruction to sailors and shipyard workers, rather than delegating the task to a myriad of vendors with incomplete information, no control of the workplace, little knowledge of mission requirements, and who were not subject matter experts on asbestos hazards. It is unreasonable to conclude that the Navy would have appreciated or accepted gratuitous advice from equipment manufacturers about hazards associated with products (like insulation) that they did not manufacture, and about which the Navy was already well aware. Finally, in light of all the evidence regarding the Government's existing knowledge and robust program to prevent ex-

posures, and other Federal and state regulations requiring the protection and education of employees, it is impossible to imagine how a mere warning on a piece of metal equipment or product could possibly have meaningfully affected personal actions, and precluded exposures to airborne asbestos fibers, years and often decades, after the product was sold.

99. My scientific and medical opinions stated herein are based upon my education and training as a scientist and as a physician; my personal and professional experiences as a certified industrial hygienist and a board-certified occupational medicine physician; my operational and industrial experiences from my total Navy career; my research and review of historical documents regarding the Navy's knowledge as well as the scientific and medical communities' knowledge of the hazards of asbestos; and my communications with industrial hygienists and physicians who worked for the Navy and Public Health Service dating back to the early 1940s. These opinions are all stated within a reasonable degree of scientific, medical, and professional certainty.

s/ Lawrence Stilwell Betts, MD, PhD 12/[illegble]/2013
Lawrence Stilwell Betts, MD, PhD Date

DECLARATION OF JOSELYN C. SENTER, CIH

1. I, Joselyn (Josh) C. Senter, CIH, declare that I retired from the United States Navy at the rank of Captain in 2004, and now work as a Senior Industrial Hygiene Consultant with Aurora Industrial Hygiene, Inc., based in San Diego and Los Angeles, California. As reflected in my Curriculum Vitae (Attachment 1), I have served as President of the Navy Industrial Hygiene Association and as a board member for the selection of naval officers eligible for promotion and command. My professional associations include the American Board of Industrial Hygiene, the American Industrial Hygiene Association, and the American Conference of Governmental Industrial Hygienists. I am board certified in the comprehensive practice of Industrial Hygiene by the American Board of Industrial Hygiene. I have been awarded the Navy Commendation medal, Vietnam Service and Vietnam Campaign medals, and was qualified as a Surface Warfare Officer while serving a!: an Unrestricted Line Officer.

2. During my Navy career, I was assigned to billets with professional duties and increasing responsibilities, initially as an officer of the Line, where I served aboard US Naval ships of war, and later as a scientist in industrial hygiene. As an Unrestricted Line Officer, I qualified as an Officer-of-the-Deck during sea operations, and was a Division Officer responsible for 20–30 enlisted personnel. As a Medical Service Corps Officer (Staff), I served as department head for industrial hygiene services at various Naval Medical Centers, as an industrial hygiene over-sight officer with the Navy Medical Inspector General, and as Senior Officer with the Chemical, Biological, Radiological

and Environmental Team at the Navy Environmental and Preventive Medicine Unit No. 5, San Diego, CA. Based upon my scientific training, my experience as a Line Officer working aboard US Naval ships, and the experience gained as a Navy officer for three decades, I am generally familiar with the industrial products that were used by the Navy and the Navy work environments, both ashore and afloat. Based upon my review of materials such as those referenced in Attachment 2, I am also familiar with the history and practice of the Navy occupational health program from its early days before World War II until the present time. I have also reviewed case specific materials and documents related to the John B. DeVries case, which is contained in Attachment 3.

3. In addressing the following issues, I have based my opinions contained in this report on my professional knowledge arising from my training, education, and experience as a scientist, and now retired, senior United States Navy officer. Additionally, my experiences from serving aboard deployed Navy vessels, an understanding of the chain of command and channels of communication, and knowledge of the decision making process at the deck plate, as it relates to asbestos and other occupational health hazards within the Navy, helped me with my findings and conclusions.

4. The issues addressed are:

   A. What was the Navy's historical IH and safety program from inception to the 1970s?

      1. How did it compare to state of the art or knowledge of others?

      2. In particular, what did the Navy know about the hazards of asbestos?

3. What were the relative shipboard asbestos exposures with which the Navy had to deal in its mandate of defending the country?

B. Was there anything about asbestos available at the time that an equipment manufacturer could have told the Navy that would have both enhanced its knowledge and made a difference in its use and handling of asbestos?

1. Even if the Navy would have permitted an equipment manufacturer to communicate such information about the hazards of asbestos to sailors if it differed from what the Navy was telling them, would it have changed the manner in which a sailor performed his job?

HISTORY OF KNOWLEDGE AND CONTROL OF ASBESTOS HEALTH HAZARDS BY THE US NAVY

5. The use of asbestos onboard naval vessels was born out of military necessity. Though many of the hazards associated with asbestos were known during the early 1920s, it appears fairly certain that its critical properties, which made asbestos a logical choice in fulfilling the Navy's need for light weight insulation material, were a driving consideration for its use. The versatile utility of the material was paramount for ship building, and, as discussed in their landmark paper addressing the use of asbestos in the Navy, LCDR W.R. Fleischer and coworkers (1946) write:

> "....***The chief reasons for the wide use of amosite felt and pipe covering in naval work are its low thermal conductivity, light weight, strength and refractoriness.***

When the felt and pipe covering were first developed, we were still building vessels under the Washington Treaty of Limitations in Tonnage, and every pound saved meant that much more armor, guns or ammunition for a given displacement, to say nothing of more economic operation for the weight involved in insulation.

Amosite pipe covering weighs about 14 pounds per cubic foot, with a weight of 16 pounds per cubic foot, and a temperature limit of 500 F, High temperature amosite pipe covering weighs about 18 pounds per cubic foot as compared to 26 pounds per cubic foot for other high temperature insulations. Because of the lower conductivity and the higher temperature limit of the amosite type, less of it need be used in combination covering than other types of insulations."

6. As previously noted, the United States Navy recognized that the inhalation of asbestos fibers in sufficient amounts (dose concentration x time) could result in pulmonary disease as early as the 1920s. In the "Instructions to Medical Officers (Notes on Preventive Medicine for Medical Officers, United States Navy" (Dublin, 1922)), asbestos was listed as one of the many inorganic and organic dusts that could cause pulmonary disease. Though Industrial Hygiene Officers were not yet a part of the Navy's Medical Department, Medical Officer's were urged to established an active program to identify hazardous exposures, and when

circumstances warranted, to advise responsible managers in the shipyards on methods to control any perceived exposures which might cause health effects.

7. Dublin recognized several methods to prevent the inhalation of these dusts (asbestos) including:

a. the use of water to control the release of dust;
b. the use of local exhaust systems to remove the dust at the point of origin;
c. the use of inclosing (sic) chambers; and
d. the use of respirators and helmets.

He stated: "***No one of these can apply to all conditions, but the particular method to be used must be adapted to the peculiarities of the process.***" Based on his recognition of the complexities of control, there is sufficient reason for me to conclude that his attentions were turned towards the control of dust which might have some deleterious effect on the worker, and not the control of dust for its nuisance properties.

8. In 1941, during the 5th Annual Meeting of Members of the Air Hygiene Foundation of America, Captain Ernest W. Brown, Medical Corps, USN, highlighted the importance of industrial hygiene to the Navy and national defense. Recognizing the potential for "***new problems in industrial hygiene***" as naval construction increased, CAPT Brown acknowledged that the Senior Medical Officer of a major Navy Yard might benefit from the establishment of a separate unit to deal with the problems arising with the growing industrial force. Prior to this view, the United States Navy had expanded the scope of its asbestos hazard control program by including the enlisted corpsmen of the medical department in the hazard

control process. In the "Handbook of the Hospital Corps" (United States Navy, 1939), the Bureau of Medicine and Surgery discussed the organization used for disease and injury prevention in the United States Navy, and took a lead position in the prevention of industrial diseases:

> ***"The government having passed such laws must therefore lead the way in protecting its own employees.... An organization has been set up in the Navy to protect its personnel, both civilian and naval, a safety engineer is provided who acts directly under the Assistant Secretary of the Navy. He has supervision of the safety precautions taken to protect the civilian employees in the navy yards, ammunition depots, torpedo stations, and the like. He is also a consultant in all matters pertaining to safely aboard ships, al training stations and other Navy Department activities. A naval medical officer is assigned to his office for the purpose of consultation in all matters pertaining to health and safety and to cooperate in devising means by which health may be protected and accidents prevented. Aside from this particular medical officer, all medical officers, dental officers, members of the Hospital Corps and nurses form the balance of the medical staff of this organization. It is essential that each of these members know and understand the hazards to the encountered in the Navy, the steps to be***

taken to protect against injury and disease, the treatment of diseases and injuries arising there from and the organization of medical personnel for such purposes. Naval medical personnel are required to perform duties ashore, at sea, in foreign countries, in the air and under the sea. In each of these places a variety of health hazards exist. It is therefore necessary that these personnel have a thorough knowledge of the industry to which they are attached, the hazards presented, the methods of prevention and the treatment of all injuries occurring.

In all navy yards, the Commandant is the head of the organization. He is responsible to the Navy Department for the protection of the employees, as well as the naval personnel, under his command. He is familiar with the nature of the work being performed by the employees at his station and on the health and accident hazards presented. Accordingly, he appoints, as the working head of the organization, a safety officer or a safety engineer, as he is better known. The safety engineer must be of sufficient rank to have become familiar with the various trades in a navy yard, a knowledge of machinery, a man of cooperative ability and well liked, and having sufficient knowledge of safety devices and appliances to intelligently make inspections and recommend proper protective

measures. His duties are primarily, to prevent accidents and promote healthy working conditions. It is his duty to inspect all working places, make a general survey of all mechanical conditions and to recommend the addition of all necessary safety appliances for the protection of the workers".

9. Interestingly, there was an early awareness that the Safety engineer might benefit from the expertise medical personnel brought to the evaluation of the industrial environments:

"The Commandant further assigns a medical officer to act as advisor to the safety engineer. The medical officer must be of the same qualifications as the safety engineer, with the addition that he must be thoroughly versed in the diseases connected with Industry... It is well for members of the Hospital Corps to understand the nature of these duties in order that they may be of assistance to him in the performance of these duties: ... He acts as consultant to the safety engineer in all matters pertaining to the general welfare and health of the employees. Hygiene and sanitation are his important duties. He must interest himself in the employees and instruct them in the everyday principles of personal hygiene and self preservation. He must instruct the employees in safety measures and encourage them to cooperate in protective measures. They must be made "safety conscious" or "safety

minded". The morale must be kept up.... The medical officer must inspect all working places in order to have a better understanding as to the actual conditions under which the men work. He must make appropriate recommendations to improve deficiencies noted and must then see that these recommendations are carried out.

The safety engineer is assisted in his work by the foremen of the shops and in some instances by safety committees in each shop elected by the employees. These men or committees are generally chosen from among the older employees and from men who have considerable experience in their trade... The organization of the medical advisor is composed of junior medical officers, dental officers, to some extent, members of the Hospital Corps, and of nurses. The duties of the hospital corpsmen are to assist the medical officer in his inspections, assist in the treatment of the injured and to prepare the necessary reports and returns in cases of accident, occupational disease, and the physical examination of employees."

The hospital corpsman was specifically instructed to help keep the workforce healthy:

"Proper working places must be provided and maintained. Hygienic and sanitary conditions must be kept on a high plane. All moving parts of machinery must be guarded, goggles provided for workers required to use them; helmets and masks for

sand blasters; proper ventilation for the chrome workers; masks for asbestos workers; protection for workers in x-ray and radium; protective gloves, shoes, and other garments for foundry workers, and other means of protection too numerous to mention here must be available and used. Special physical examinations must be made of all sand blasters, asbestos handlers, those exposed to radium and its compounds, lead workers, those engaged in dusty or smoky trades, handlers of T.N.T. and other explosives, etc., to prevent the occurrence of the diseases associated with those trades from injuring the men."

10. The Navy's approach to the recognition and control of health hazards in the work environment, through its use of medical advisors to the safety engineering department, illustrates how a different design of assessment of the workplace evolved as new materials were introduced into the Navy Yards. The practice of wetting down insulating material, using gloves and respirators in dusty environments, was prominently noted in the "Annual Report of the Surgeon General, US Navy to the Secretary of the Navy" by Captain EW Brown, MC, USN (1941).

11. When quantitative assessment (counting) of asbestos particles in air was available, the Navy followed the recommendations of the United States Public Health Service. Based upon the findings of W. C. Dreessen and coworkers' (1938) study of asbestosis in the textile industry prepared by direction of the United States Surgeon General, the United States Navy accepted an exposure level of 5 million particles

per cubic foot (5 MPPCF) as the time-weighted average (TWA) for occupational exposure. Dreessen *et al.* concluded:

> ***"It would seem that if the dust concentration in asbestos factories was kept below 5 million particles (the engineering section of this report has shown how this may be accomplished), new cases of asbestosis would probably not appear."***

Note: The American Conference of Governmental Industrial Hygienists (ACGIH) has defined the TWA as the ***"concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, for a working lifetime without adverse effect."***

12. The Navy's occupational health program was based upon internal support for the identification and control of occupational health hazards. In order to develop a sufficient cadre of physicians and scientists, the Navy developed training programs with Columbia University's DeLamar Institute of Public Health and the Harvard School of Public Health. By the end of World War II, over one hundred physicians, scientists, and engineers had been trained in occupational health at these two leading institutions of US public health.

13. In addressing exposure to asbestos, Philip Drinker, then Chief Health Consultant for the United States Maritime Commission, and Professor in the Harvard School of Public Health program that was training the Navy physicians, scientists, and engineers, recommended an occupational exposure level of 5 MPPCF,

(Drinker, 1944). This is the same value as recommended by Dreessen and coworkers (1938) to prevent the development of disease.

14. "Minimum Requirements for Safety and Health in Contract Shipyards" were drafted in 1942, and approved by the US Navy and the US Maritime Commission in early 1943. At the time, the criteria set were considered the foremost health and safety standards established. At a minimum, the commission mandated:

> ***"Each contractor is hereby given notice that the Navy Department and the Maritime Commission will expect full and complete compliance with the minimum standards which bear the approval of the Navy Department and Maritime Commission, and each is requested to give full cooperation to the consultants on health and safety who will be charged with the coordination and supervision of the safety and health program of the two agencies."***

15. Within a few months following the implementation of the Minimum Requirements, the Secretary of the Navy (Forrestal, 1943) reaffirmed these requirements for all private shipyards having Navy contracts. The aim of this initiative established baseline standards from which safety guidelines could be discussed and implemented at all shipyard facilities. An inspection team, comprised of safety and health inspectors, would make visits and document discrepancies in worksite operations. Those discrepancies considered significant were first discussed with the shipyard management, thus allowing management the opportunity to take corrective action for imminent dangers.

The actual written report was submitted in draft form to the regional director of the Maritime Commission for final typing and distribution.

16. The Navy continued to use 5 MPPCF as a reasonable value for asbestos exposure as a maximum allowable concentration. This had been the recommended value by the National Conference of Governmental Industrial Hygienists in 1942, and later adopted by the American Conference of Governmental Industrial Hygienists (ACGIH) in 1946. Among the members of the ACGIH in 1946, "*a private, not-for-profit, nongovernmental corporation whose members are industrial hygienists or other occupational health and safety professionals dedicated to promoting health and safety within the workplace*", were three representatives of the Navy Department and forty-two representatives from the United States Public Health Service. The use of the 5 MPPCF level as the occupational exposure value continued to be generally accepted by professionals practicing occupational health in the United States. This occupational exposure value, and the widespread use of asbestos, continued in the Navy until the late 1960s when the scientific and medical communities (Selikoff 1965, 1967) and the United States Navy (Commander NAVSEC, 1969; Officer-in-Charge NAVSEC Phila, 1969) had evidence that it was not sufficient to adequately control the health effects of exposure.

17. The Navy used the occupational exposure level that the best scientific and medical evidence supported. In 1955, the Navy adopted the "Threshold limit values for toxic materials" developed by the American Conference of Governmental Industrial Hy-

gienists as a basic reference and "***to provide guidance toward the reduction of potential health hazards encountered in the industrial environment for both military and naval civilian personnel.***" The Navy (BUMED, 1955) recognized that:

> "***[The] threshold limit values should be used as a guide in the control of health hazards and should not be regarded as fine lines between safe and dangerous combinations. The most desirable levels in all cases are those approaching zero, but practical considerations frequently require the acceptance of higher levels which are safe, but not ideal.***"

Moreover, the Navy recognized that:

> "***[The] threshold limit values ... are based on the best available toxicological information, long-term industrial experience, and experimental studies. In as much as these values are constantly being reevaluated, revisions or additional will be made as further information becomes available.***"

18. On January 7, 1958, the Department of the Navy issued its "Safety Handbook for Pipefitters". This handbook was one of many safety handbooks issued by the Navy as an aid in safety indoctrination and accident prevention. That handbook provides, in part:

> "***Asbestos. Asbestos dust is injurious if inhaled. Wear an approved dust respirator for protection against this hazard.***"

19. During the 1960s, the Navy continued to promulgate procedures and emphasized the hazards of asbes-

tos in publications for both Navy and civilian employees. For example, in the October 1962 issue of its *Safety Review* journal, published an article published by Capt. H.M. Robbins, M.C., and W.T. Marr, industrial hygienist, entitled "Asbestosis." This article stated:

> ***"The worker's best protection is to avoid careless creation of dusty conditions, use damp material when possible, and wear respiratory protection constantly. There is, at present, no known cure for asbestosis. Once a person has contracted the disease he has suffered a loss of health which cannot be redeemed."***

On the civilian side, the Navy's April 1965 publication *Safety Precautions for Shore Activities*, issued by the Office of Civilian Manpower Management, which purpose was" to alert safety and supervisory personnel to the hazards involved in the use of certain materials and provide the necessary precautionary measures" re-enforced BUMED's, adherence to the TLVs, and specifically stated:

> ***"2058. MINERAL DUSTS***
>
> ***Certain mineral dusts are pneumoconiosis (a pathological lung condition produced by mineral or metallic dust inhalation producing. The most prevalent and insidious forms are silicosis and asbestosis caused by prolonged inhalation of dusts (or mists) containing silica or asbestosis.***
>
> ***2. Asbestosis. The effects of asbestosis are similar to and just as disabling as those of silicosis. There is evidence, however, that***

the handling of asbestos products in the Navy are not so well controlled, if the prevalence of asbestosis is any indication. Exposure to asbestos dust is usually encountered in the installation, repair and removal of insulating pipe covering principally used aboard ship. The following precautions should be taken in any dust making operations involving asbestos products:

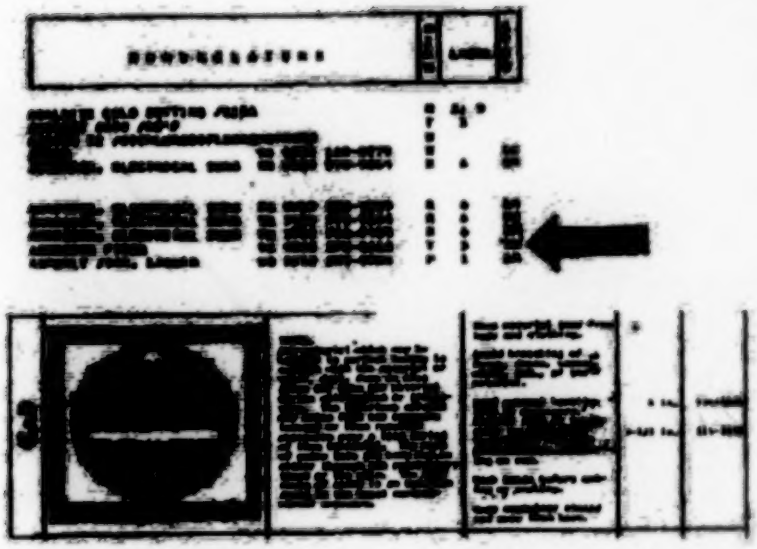
a. Provide permanent general ventilation in areas where dust producing operations are usually performed.

b. Install exhaust hoods over saws and other dust making machine tools.

c. Require workers to wear dust respirators where dusty operations cannot be adequately ventilated.

d. Use industrial vacuum cleaners in lieu of dry sweeping of floors and other surfaces."

20. In its 1969 Consolidated Hazardous Items List, the Navy specifically identified asbestos as a toxic substance requiring a Level 3 hazard label which is set-out below:



Similarly, several asbestos-containing adhesives were also classified as Level 3 toxic hazards in the 1969 CHIL list.

21. Selikoff, in a paper written with Lee in 1979 (Lee, 1979), wrote:

> ***"What's past is prologue!" The decade of the 1960s provides a convenient time at which to terminate a historical view of asbestos disease. With admirable hindsight from the late 1970s we can see that the essential evidence had already been reported, but not yet assembled or vested with sufficient credibility to be entirely convincing. With few exceptions, the evidence at that time rested on scattered reports of small numbers of cases, and the cases themselves suffered from being either selected or simply those that hap-***

pened to come to the attention of the reporter. The population base from which the cases came was seldom mentioned. The significance of pleural changes and the occurrence of mesothelioma in persons without a distinct history of exposure remained in considerable doubt. The idea that asbestos could be at least a cofactor in the production of bronchogenic carcinoma was far from fully accepted. That parenchymal asbestosis was very likely to occur in those who had been exposed to heavy dosage in the early years of the industry was clear enough, but what effect environmental controls that had been introduced in the late 1930s might have upon its future prevalence was unknown. The possibility that quite low dosages might have grave consequences 30 or more years after first exposure was still unproven.

Many things were needed to confirm the suggestions that were emerging from the studies up to that time. Most importantly, systematic epidemiologic investigation was needed of large cohorts drawn from various types of industry, with the inclusion of adequate control populations. Some of these were already organized, but it was too early for the results to be meaningful. We now know that much of the negative evidence stemmed from coming to conclusions prematurely, before the slow processes of carcinogenesis had had a

chance to make themselves evident. We now know also that reduction of heavy exposures that lead to early death would reveal such slowly developing diseases as mesothelioma and bronchogenic carcinoma with increasing clarity. But foreknowledge was not available at the time, although some investigators suspected that the auguries were not good. More sophisticated and sensitive ways of recognizing the disease processes at an early stage, before the appearance of marked radiographic changes, were badly needed. A series of international conferences, some already in the planning stages, were to accelerate these developments greatly. Those who felt that it was an exciting time were not to be disappointed. The excitement has not even yet been entirely dissipated."

22. It was not until 1970, that statutory "permissible exposure limits (PELs)" were nationally established under the Occupational Safety and Health Act (PL 91-596). The PELs were based upon the occupational exposure levels published as the 1968 ACGIH threshold limit values (TLVs). These national standards applied to shipyards, as well as other industries using asbestos. At the time of enactment in 1971, the PEL for asbestos was initially 12 fibers per cubic centimeter (f/cc). However, based upon the evolving and current scientific and medical recommendations by the time of enactment, the Occupational Safety and Health Administration (OSHA) emergently lowered the PEL to 5 f/cc (ceiling value of 10 f/cc) in late 1971,

with a permanent standard of 2 f/cc becoming effective in 1976. In 1975, OSHA recognized sufficient medical and scientific evidence of human carcinogenicity to recommend the reduction of the permissible exposure limit to 0.2 f/cc. After legal challenges, OSHA reduced the PEL to 0.2 f/cc in 1986, and further reduced it to its current value of 0.1 f/cc in 1994. Requirements from the highest levels of authority in the United States Navy established the permissible occupational exposure levels and control methods as they changed during this post-OSHA era (DoN, 1971; BUMED, 1973; OPNAV, 1974.)

23. I believe that the existing archives of papers, instructions and manuals demonstrate the concern of Navy personnel with the health threat potential of asbestos in the workplace. From its early introduction, to its growing usage, it is my professional opinion and experience as an Industrial Hygienist that the Navy was not only aware of the health hazards associated with the use of asbestos, but encouraged and nurtured an expertise in the safety and management of its use as early as the 1920s. Merging an occupational health concern with a vigilant safety engineering program, the Navy ushered in a new model of addressing environmental and occupational exposures brought about with the use of asbestos. It was the Navy's position to establish state-of-the-art science as a means to limiting the health hazards from material deemed "necessary" to its mission. And, in developing this approach, a responsive climate of advancing the knowledge and science of controlling the release of asbestos fibers became a hallmark to its characterization of hazards in the work environment.

WAS THERE ANYTHING ABOUT ASBESTOS AVAILABLE AT THE TIME THAT AN EQUIPMENT MANUFACTURER COULD HAVE TOLD THE NAVY THAT WOULD HAVE BOTH ENHANCED ITS KNOWLEDGE AND MADE A DIFFERENCE IN ITS USE AND HANDLING OF ASBESTOS?

24. Captain NE Rosenwinkel, MC, USN, representing the Navy's Surgeon General and the Bureau of Medicine and Surgery, provided information regarding the Navy's knowledge of asbestos hazards to shipyard employees for inclusion in a statement issued by Rear Admiral JJ Stilwell, USN, of the Shipyard Management Directorate, Naval Sea Systems Command in 1968 (Rosenwinkel, 1968):

> ***"The United States Navy is well aware of the hazards of asbestos to its employees engaged in ship construction and ship repair at naval shipyards. Hazard control measures implemented by the shipyard medical departments and safety divisions are in accordance with accepted standards of industrial hygiene practices in the United States. Stringent efforts are directed at keeping the concentration of airborne asbestos dust below the level recommended by the American Conference of Governmental Industrial Hygienists. An energetic periodic physical examination program insures the health of personnel exposed to this hazard."***

25. The technical and scientific knowledge possessed by the US Navy, with respect to the specification and utility of asbestos, and the potential health hazards

associated with its use onboard US Navy vessels, was deemed state-of-the-art. Precautions taken by the Navy to insure asbestos exposures were minimized predates much of the scientific and medical proof that asbestos could cause lung fibrosis by Cooke in 1924, and the use of the term "asbestosis" by Sir Thomas Oliver in 1925. The potential for this inorganic dust to cause harm was recognized by Dublin in his "Notes on Preventive Medicine for Medical Officers, United States Navy" in 1922. In this document, Dr. Dublin addresses asbestos exposure as one of the "OCCUPATIONAL HAZARDS AND DIAGNOSTIC SIGNS: A GUIDE TO IMPAIRMENTS TO BE LOOKED FOR IN HAZARDOUS OCCUPATIONS."

26. The health hazards associated with asbestos had been addressed by the Navy in its occupational health and safety programs pre-dating World War II. The knowledge of the hazards created by the use of asbestos containing materials was weighed with respect to the vital benefits provided. The Navy sought to control asbestos exposures consistent with developing scientific and medical knowledge, and, as such, balanced its potential for harm against the needs for national defense.

27. The Navy's asbestos control program, multifaceted and complex, included hazardous process identification, engineering controls, use of alternative materials in accordance with Navy specifications, personal protective equipment, training and education, and medical surveillance. The emphasis on each of these elements was dictated by the level of exposure to airborne asbestos fibers.

28. In 1978, testimony provided by the Navy at a Congressional subcommittee noted the following:

"In addition to thermal insulation, other shipboard asbestos applications include those products which can be found in general use by industry and in homes and office buildings. Floor tiles, various gaskets and valve stem packings and galley range insulation are just a few examples. However, this asbestos is in a bonded or contained form and routine careful handling would preclude emissions of potentially hazardous levels of airborne fibers." Captain JC McArthur, USN (1978)

29. Gaskets and packing materials were classified as a minimal hazard. Because of its characteristics, respirable asbestos fibers were unlikely to be generated into the atmosphere during prescribed applications. (Lawrence Liukonen et al, 1978). Many Navy and other published studies have confirmed that the greatest potential for exposure to airborne asbestos fibers aboard ship comes from the uncontrolled application and removal of thermal insulation, not the handling of gaskets and packings (Robbins and Marr, 1962; Marr, 1964; Liukonen et al, 1978; Mangold et al, 1978; Williams et al, 2007; Hollins et al, 2009).

EVEN IF THE NAVY WOULD HAVE PERMITTED AN EQUIPMENT MANUFACTURER TO COMMUNICATE SUCH INFORMATION ABOUT THE HAZARDS OF ASBESTOS TO SAILORS IF IT DIFFERED FROM WHAT THE NAVY WAS TELLING THEM, WOULD IT HAVE CHANGED THE MANNER IN WHICH A SAILOR PERFORMED HIS JOB?

30. The Navy plays a vital role in maintaining our national security. As such, the complexities that comes

with managing a massive organization dictates a uniformity of action and understanding throughout. More so than a civilian work environment, a consistent doctrine of communication and leadership is critical to the well being and safety of everyone who serves in the uniform services. Thus, as stated in ***"The Bluejackets' Manual"*** (United States Naval Institute):

"The chain of command exists to ensure that:

1. **The Navy and its sailors do their jobs without confusion and without wasting time and effort.**
2. **Those in charge know what their responsibilities are.**
3. **Everyone is accountable to someone for his or her job and actions.**
4. **There is a sense of direction, so that everyone knows what they're supposed to do.**
5. **Clear communication exists, both up and down, so there will be no doubt where you or anyone else stands in the chain of command."**

31. As a matter of guidance and control, Department of Defense Form 1966 (DD1966), *Enlistment/Reenlistment Document - Armed Forces of the United States*, Section C, illustrates the distinctiveness of the military (Navy) culture a member is expected to live within as a result of his/her enlistment. A member of the Armed Forces agrees that:

".....Many laws, regulations, and military customs will govern my conduct and require me to do things a civilian does not have to do. The following statements are not promises or guarantees of any kind. They explain some of the present laws affecting the Armed Forces which I cannot change but which Congress can change at any time.

a. My enlistment is more than an employment agreement. As a member of the Armed Forces of the United States, I will be:

(1) Required to obey all lawful orders and perform all assigned duties.

(2) Subject to separation during or at the end of my enlistment. If my behavior fails to meet acceptable military standards, I may be discharged and given a certificate for less than honorable service, which may hurt my future job opportunities and my claim for veteran's benefits.

(3) Subject to the military justice system, which means, among other things, that I may be tried by military courts-martial.

(4) Required upon order to serve in combat or other hazardous situations.

(5) Entitled to receive pay, allowances, and other benefits as provided by law and regulation.

b. Laws and regulations that govern military personnel may change without notice to me. Such changes may affect my status, pay, allowances, benefits, and responsibility as a member of the Armed Forces REGARDLESS of the provisions of this enlistment/reenlistment document.

c. In the event of war, my enlistment in the Armed Forces continues until 6 months after the war ends, unless my enlistment is ended sooner by the President of the United States.

32. In some regards, these parameters might appear overly harsh and restrictive. Yet, as with much of the guidance and control placed before service members, a well defined statement of expectations and consequences is essential to good order and discipline. Upon this foundation, standards of uniformity in communications is reflected in SECNAV Instruction 5100.8 — which is an internal directive from the Secretary of the Navy directing Navy personnel, not manufacturers of material or equipment, of the manner in which to carry out their obligations—Para.l states:

> ***"The purpose of this Instruction is to standardize labeling requirements for hazardous chemical products during usage..."***

33. MILSPEC-M-15071D, Para. 3.3.1, makes it clear that equipment manufacturers' manuals must first be approved by the Bureau of Ships and the "manual shall not be modified without approval of the Bureau of Ships." Moreover, it cautions:

> ***"Notes, cautions, and warnings should be used to emphasize important critical instructions. The use should be as sparing as is consistent with real need."***

It is because clear and concise communication is so important to the Navy's routine operation that it is highly improbable that unsolicited and gratuitous warnings regarding the use of materials made by commercial vendors would be allowed, especially if they were redundant and/or inconsistent with the Navy's existing communications in this regard. Any suggestion that a manufacturer was free to depart from Navy-approved manuals and instructions would not be consistent with the uniformed practice of the Navy.

34. With the increasing use of asbestos in World War II, the Navy expanded its occupational health programs for asbestos and other chemical, physical, and biologic agents which were consistent with the accepted state-of-the-art for each of these potential hazards at that time. Notably, these wartime programs were discussed by Captain Brown in 1941. Philip Drinker, as the United States Maritime Commission's Chief Health Consultant in 1945, wrote to the Navy's Bureau of Ships, recommending that 5 MPPCF be used as the industrial hygiene control level – even before that level was formally recommended by the American Conference of Governmental Industrial Hygienists in 1946. This is the same value that was used as the occupational exposure level in the noteworthy "Fleischer-Drinker study" published in 1946.

35. As previously noted, the Navy's knowledge regarding the applications of asbestos-containing products and their health effects represented the state-of-the-art. Through the occupational safety and health

program, and the dissemination of information through the chain of command, nearly all Navy sailors serving on WWII era ships, by and through the late 1960s, were alerted to the hazards of asbestos. Instructions, specifications and internal directives addressed the health hazards associated with asbestos so often that it was a standard assumption that all high temperature thermal insulation used on steam pipes contained asbestos. The exact type and composition of the thermal insulation may not have been known, but the use of asbestos for such application was so universal that identification of the insulation as asbestos-containing was often assumed – even in instances where it had been replaced with fibrous glass, mineral wool, or other non-asbestos materials. As a fundamental aspect of Navy training and practice, dust control and a high level of general cleanliness, even in the engineering spaces, were routinely maintained as part of the Navy shipboard environment. Thus, in my experience as a Line Officer, major repair operations on turbines and other engine room equipment was routinely deferred at sea for in-port periods, unless dictated by emergencies, where environmental controls could be effectively employed.

36. Mr. DeVries, through his testimony, made no reference to precautions or protective equipment worn by himself, his charge, or workers from the shipyards. As previously discussed, however, navy publications of various types described hazards, safe work practices, and the importance of Navy personnel utilizing personal protective equipment when working with asbestos. Shipyards, especially, during the Late 1950s and into the 1960s, were under heavy scrutiny to comply

with established procedures for handling asbestos insulation. Along with directives from the Type Commanders (NAVSEA, BUMED, NAVSHIPS, etc.), it has been clearly demonstrated that the Navy made every attempt to educate its civilian and military personnel on many levels. Along with this concerted effort to institute a comprehensive asbestos program, the Navy relied on its chain of command to execute all elements of the program prudently. Not providing personal protective equipment to personnel performing asbestos operations would represent a serious, and notable, failure to promote a safe and healthful environment. Such a failure to follow and execute a direct order from higher authority would potentially result in severe consequences for commanding officers and senior personnel. For Mr. DeVries, serving as a junior officer, and later as the Department Head of Engineering, to have not been aware of the hazards of asbestos seems implausible. Had he been present in the shipyard during insulation removal by civilian workers, if only for a brief period, he would have witnessed personnel employing respirators and other protective measures previously discussed. It would be reasonably expected for any newly commissioned officer to inquire as to the "whys" for the protective posture of workers working in his space of responsibility, and to have then been informed that it was required for asbestos work.

37. Historically, the Navy has relied upon officers to familiarize themselves with all directives impacting the safety and well being of personnel placed in their charge. To that end, the knowledge of safe practices was continually promulgated to junior and senior per-

sonnel alike. This method of communicating important information, unlike communications from vendors and manufacturers, insured consistency. Taking into account Mr. DeVries engineering degree at Cornell University, then later training at the Navy's Engineering School, to have been instructed in the need for, and the various types of insulations used within engineering spaces and not have been introduced to the potential dangers associated with working with asbestos seems unlikely.

38. The potential exposure of active duty Sailors to significant levels of asbestos fibers was only recognized under unusual conditions – such as periods in which ships were "in the yard" for overhaul or undergoing significant maintenance (Wynkoop, 1947). The fact that asbestos was used throughout naval vessels does not, in itself, extrapolate into continuous exposure to personnel assigned to that vessel. To give credence to this supposition, one would have to accept that every sailor, despite his rank, rate, and work station, was in jeopardy of "*significant exposure(s)*" to asbestos. A supposition disproven with industrial hygiene sampling results for non-asbestos operations aboard ships, and in shipyards (Robbins and Marr, 1962; Marr, 1964; Liukonen et al, 1978; Mangold et al, 1978; Williams et al, 2007; Hollins et al, 2009).

39. It is important to note that the assertions made by Captain R. Bruce Woodruff, USN (Ret), an expert for the plaintiff, that "*Without doubt or question, Mr. DeVries received significant exposure to asbestos during his more than 1000+ days assigned to the Turner.....*"does not localize the source of Mr. DeVries' exposure. It has been my experience, as a Navy Industrial Hygiene Officer, Medical Service Corps, that

air sampling procedures which allow for qualitative and quantitative analysis during microscopy examination, are necessary to support such claims. To that end, while CAPT Woodruff may have experience and knowledge regarding the potential installation of insulation on a naval ship, he does not indicate any formal training or expertise in air sampling analysis and strategies, comparable to those practiced by an Industrial Hygienist, to make the aforementioned type of determination with any reasonable degree of credibility or certainty.

40. The Navy's occupational health program not only addressed asbestos exposure, but it had a significant medical component which contributed to advancing the state-of-the-art knowledge. In 1955, Mr. JR Sheehan, an industrial hygienist at the Long Beach Naval Shipyard, wrote to Mr. Webster Ay, the Secretary of the Asbestos Union #20 at that Yard, to inform him of the availability of a new medical test being developed by Hurley Motley, MD (at the University of Southern California) to measure early pulmonary function changes and encouraged its acceptance and use among the Yard's asbestos workers, pipe coverers, and insulators. This type of test later became commonly used as it was more sensitive than chest radiography in detecting early lung changes from dust exposure. In addition to industrial hygiene engineering controls, the Navy also developed task specific training for individuals potentially exposed to levels of asbestos exceeding 5 MPPCF.

41. In the late-1950s, Mr. W.T. Marr (Bremerton Navy Shipyard) was investigating alternate sampling and measurement techniques for the evaluation of asbestos. He proposed that fiber length and concentration

was more indicative of injurious exposures to personnel than one which depended purely on particle counts. This was a departure from the methodology that was in general acceptance, and it changed the overall direction that the Navy would move, and later accept, as the standard maximum exposure for asbestos changed from 5 MPPCF to 2 fibers per cubic centimeter (2 f/cc).

42. This progressive approach to safeguarding the health and safety of Navy personnel was in keeping with the philosophy of those who were charged with the responsibility within the Navy in that:

> "*.....there is no higher priority in peacetime operations than the safety and well-being of the ship and crew. Make clear to the crew that this is your highest priority, and that you expect it to be theirs as well.*" (The Naval Officer's Guide)

The flow of information, as it affects the crew, is always critical to good order and discipline.

> "*There are many customs unique to the naval service. The origin of some of these is obscure, but Navy members conscientiously observe them none the less.*" (The Naval Officer's Guide)

43. According to Mr. DeVries testimony, and his personnel records, he was assigned to the USS Turner for 3 years as of June 1957. As a surplus engineering officer, it is unclear when Mr. DeVries assumed the duties of the Engineering Department Head, but it is unlikely that as an Ensign he would have been placed in this position until he had attained sufficient experi-

ence and rank. According to his medical records, Ensign DeVries received his promotional physical, and was deemed physically qualified for temporary promotion to Lieutenant junior grade (LTJG), on 24 October 1958. This would suggest that as late as November 1958, Mr. Devries was probably still in a subordinate role in the Engineering department aboard the Turner.

44. Mr. DeVries also testified that the Turner completed 2 Mediterranean cruises (usually 6 months in duration, with 8–10 months of down time and local operations), and 2 yard periods (averaging approximately 10–12 weeks) during his time onboard. If Mr. DeVries' only "significant exposure" to asbestos occurred during his time in the Navy, based on my experience as a line officer, any potential exposure to asbestos from the ship's turbines, in comparison to the numerous equipment issues, failures and maintenance he faced throughout the engineering spaces and other areas of the ship, would be relatively miniscule with such a full operational schedule.

45. Further, from my experiences as a junior officer aboard a naval ship at sea, standing watches on the bridge, while in a 4-section watch schedule, often took precedence over many of your other duties. Mr. DeVries would have had to rely on senior enlisted personnel in his engine room spaces to supervise junior personnel and conduct many of the day to day tasks. As a junior officer, during his first assignment, his principle responsibility would be to learn how to drive the ship. I believe Mr. DeVries overlooks how much his reliance on his senior enlisted personnel may have been, and fails to recall how much his initial time onboard was spent being a division officer, responsible

for passing the word from officers more senior to him. A responsibility considered vital in grooming young officers for roles in management.

46. Strict adherence to the established methods of "passing the word" via the chain-of-command has continued to be the traditional way the Navy communicated important information. Even if an equipment manufacturer had communicated directly with a sailor, or the engineering officer of a naval ship, such as Mr. Devries, and that information about asbestos hazards was different from what the Navy was communicating neither sailor nor officer would have little choice but to continue to follow the chain-of-command. In other words, he would have been ordered to continue to follow the established and communicated Navy procedures for his activities.

47. In summary, with the introduction of asbestos into the engine room spaces of naval vessels, the Navy initiated a progressive occupational health program to address any potential consequences of its use. Within the engineering, safety and medical departments, a recognized expertise developed which set state-of-the-art standards and industry guidelines for the handling of asbestos. Where very little scientific evidence of the potential health threat was available, the Navy created a framework of instructions and guidance to implement safeguards within its traditional command structure. The communication of the health and safety threat to personnel was accomplished through directives and the existing chain-of-command, and was not dependent on instructions from commercial manufacturers. Even in the improbable scenario in which an equipment manufacturer directly warned a sailor about the hazards of asbestos in a manner that

differed from what the Navy knew and was communicating, he would have been ordered to continue to follow the established and communicated Navy procedures for his activities.

I hold the above opinions to a reasonable degree of scientific and industrial hygiene certainty.

s/ J.C. Senter	September 3, 2013
J.C. Senter	Date

JOHN B. DeVRIES

* * *

Page 80

Q. Whose job was it to perform work on the turbines?

A. Well, it would be a machinist mate's job, but, believe me, I was on top of whoever did the work. That was the — that was necessary.

Q. Do you know if any of the work on the turbines involved the use of asbestos-containing products?

A. The turbines were insulated.

Q. And, again, is this the exterior insulation?

A. This was exterior insulation.

Q. Do you recall any writing on that insulation?

A. None.

Q. Do you know who manufactured any of the insulation?

A. I do not.

Q. And as you sit here today, do you have any personal knowledge that that exterior insulation did in fact contain asbestos?

A. I have no knowledge that it contained asbestos.

* * *

Page 330

A. Yes.

Q. Okay.

MR. REICH: You are just talking in general about —

MR. KATTNER: I'm talking in general right now.

MR. REICH: Okay.

BY MR. KATTNER

Q. With respect, however, to the selection of what insulation was put on the turbine on the TURNER at the time of its initial installation in 1945, I take it you have no knowledge as between the equipment manufacturer or the shipbuilder in Bath, Maine who selected that insulation, do you?

A. I have no knowledge.

Q. And with respect to the Navy specifications as to use of asbestos or other materials on turbines or other machinery you do not have personal knowledge as to what besides asbestos the Navy may have specified?

A. I have no personal knowledge of it.

Q. Okay. Now, and with respect to specifications that might say the equipment

* * *

Page 349

BY MR. KATTNER:

Q. The mud was used elsewhere on the pipes throughout the ship; correct?

A. The mud was used for repair of insulation on other parts of the ship.

Q. And some of these pipes with insulation you described yesterday went through the berthing or sleeping areas, correct, of the ship?

A. First of all, I don't know what went through the crew's berthing areas.

Q. How about the officers' berthing area?

A. The wardrooms may have had a pipe or two go through, not many.

Q. How about the passageways, were there pipes through there?

A. In the passageways, yes.

Q. And they had this insulation on many of them?

A. They were insulated.

Q. Now, as far as the blankets, were there blankets used on other equipment besides the turbine?

A. Yes.

Page 350

Q. And as to the content of those blankets, do you know what it was?

A. No.

Q. And as to who manufactured those blankets, do you know who manufactured them? Did they have any label or name on the blankets themselves?

A. No.

Q. Now, with respect to various signs and warnings or indicators around the ship, I understand there were — the Navy used certain indicators as to types of pipes or types of equipment; correct? There were painted markings on some things?

A. Some were marked.

Q. Okay. Do you know who as between the Navy and the manufacturers determined what markings would be on such pieces of machinery or equipment?

A. Some equipment manuals from manufacturers as General Electric specified the marking.

Q. Well, were these operational markings?

A. I do not recollect the words used or

* * *

Page 373

MR. REICH: He answered that already.

MR. KATTNER: He said he didn't. Okay.

BY MR. KATTNER:

Q. You don't know manufacturer or what composition?

A. I don't know.

Q. Okay. And just from looking at it with your naked eye, is it safe to say you can't personally identify asbestos versus mineral wool versus other fibers or insulating materials at this time, can you?

A. No.

Q. And you couldn't back then at the time in the Navy, could you?

A. I certainly couldn't then.

Q. Okay. Now, after you left the Navy, I take it your testimony is you have no further asbestos exposure that you attribute to General Electric over the course of the remaining part of your life?

A. No further asbestos exposure.

Q. Of any kind?

Page 374

A. Of any kind.

MR. REICH: To his knowledge.

BY MR. KATTNER:

Q. To your knowledge?

A. yeah. To the best of my knowledge, yes.

Q. I've got you. Now, you made reference to — you said, I know your Interrogatory Answers said several times you never smoked cigarettes. Did you ever smoke any other kind of tobacco product?

A. I think I tried a pipe once.

Q. I see. Literally only one time?

A. Too much work.

Q. I've got you. About when was that?

A. In college.

Q. Okay. That was the '52 to '57 time frame?

A. That's right. An hour of —

Q. Okay. I know there was some reference to a home inspection somewhere around 2011 at your Bridle lane property.

A. No. Gravel Hill Lane property.

Q. Gravel Hill Lane.

MR. REICH: I'm going to

* * *

Page 386

Q. — on them?

A. They were insulated.

Q. What's the purpose of insulation on the main propulsion turbines?

A. Well, a turbine converts heat energy into movement and you — superheated steam, 600 pound pressure steam is at the entry point. You don't want to lose any heat. And of course you don't want — you don't want anybody to get burned.

Q. So there were really two purposes, one for safety, people not touching it and getting burned; is that correct?

A. One is safety and one is efficiency of the operation.

Q. Now, with regard to the ship's service generator, do you recall what company manufactured that?

A. I believe it was General — it was General Electric.

Q. Okay. And do you remember whether there was any asbestos on the ship's service generator, if you recall?

A. Normal insulating material, electrical

* * *

Page 405

insulation on any of these drive turbines, you don't know, do you?

MR. REICH: And I object. He's already answered that a number of times.

BY MR. KATTNER:

Q. And you have no information that General Electric supplied any of the external insulation on any of these turbines, do you, you yourself?

A. I have no personal information.

Q. And the same thing, you have no knowledge that Westinghouse supplied any of that insulation?

A. I have no personal information to say Westinghouse supplied it.

Q. And whether the Navy specs say it was supplied bare metal or not that's something the Navy specs will tell us; is that correct?

MR. REICH: Objection, asked and answered.

MR. KATTNER: Okay. Thank you.

MR. REICH: I think this might be a good time to break for lunch.

* * *

JOHN B. DeVRIES and ROBERTA G. DEVRIES, h/w	:	COURT OF COMMON PLEAS PHILADELPHIA COUNTY
Plaintiffs,	:	DECEMBER TERM, 2012
vs.	:	
ALLEN-BRADLEY COMPANY, et al.	:	NO. 3661
Defendants,	:	ASBESTOS CASE

TUESDAY, JANUARY 15, 2013

Videotaped Discovery

Deposition of JOHN B. DeVRIES, taken pursuant to notice, held at the offices of Veritext National Court Reporting Company, 1801 Market Street, Suite 1800, Philadelphia, Pennsylvania on the above date, beginning at or about 10:10 a.m., before Kathleen Woods Logue,

Professional Reporter and Notary Public there being present.

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Page 40

Q. Upon graduation from Cornell did you then obtain a job?

A. No.

Q. What did you do after graduation?

A. The U.S. Navy had sent me to Cornell.

At the conclusion of my college I immediately was commissioned an ensign and reported to the USS TURNER.

Q. Do you recall the date when you enlisted in the U.S. Navy?

A. Well, properly I entered the Navy before going to Cornell as a midshipman at Cornell.

Q. When did you actively join the Navy?

A. June of 1957. Again, when I reported aboard the USS TURNER.

Q. And when were you discharged from the U.S. Navy?

A. June of 1960.

Q. Did you serve aboard any other ships or at any other bases aside from the USS TURNER?

A. No.

Q. When you were discharged from the Navy in 1960 did you then obtain a job?

A. Yes.

* * *

Page 62

that correct?

A. The caption?

MR. REICH: That's what this is called.

THE WITNESS: Yes.

BY MR. REICH:

Q. Did you also review records from the USS TURNER?

A. Is that what this —

MR. REICH: Yes. Not until after he reviewed the caption and initiated.

MR. STOKES: Okay. And we'll get to those documents briefly here.

BY MR. STOKES

Q. When you first reported to the U.S. Navy in June of 1957, where did you report to?

A. Newport, Rhode Island.

Q. And for how long did you spend, how much time did you spend at Newport, Rhode Island?

A. The TURNER was moored, moored out in the bay at Newport.

Q. Did you ever have to undergo basic training at any time?

A. No.

Page 63

Q. Did you receive any training from the U.S. Navy prior to boarding the U.S. TURNER?

A. Other than four years of Naval Science at Cornell.

Q. And when you say four years of Naval Science at Cornell, were those classes that you took towards your education?

A. Classes.

Q. Were those classes you took through your education at Cornell?

A. Please let me hear that question again.

Q. Well, let me ask you. What was the four years of Naval training at Cornell?

A. Supposedly the same training that an Annapolis grad got.

Q. And what sort of subjects did you learn though the Navy training at Cornell?

A. Navigation, leadership. I do not recollect.

Q. Did you receive any mechanical training at Cornell?

A. No, not from the Navy.

Q. Did you receive any training through that Navy training at Cornell regarding the

operation of a ship or a Navy vessel?

A. Yes, in the sense of how you would control the ship on the bridge.

Q. Did you receive any training regarding any of the engine departments or engine rooms of the ship at Cornell?

A. No.

Q. What was your position in the U.S. Navy when you first boarded the USS TURNER?

A. Ensign.

Q. Can you describe to those of us and to the jury what an ensign is?

A. Ensign is the lowest commissioned officer in the Navy.

Q. And for how long did you serve as an ensign aboard the USS TURNER?

A. I do not recollect when I was promoted to lieutenant JG, but I was JG for half, at least half the time on the TURNER.

Q. And it's my understanding that you served aboard the USS TURNER for approximately three years; is that correct?

A. Three years.

Q. So would it be safe to say that you

Page 65

spent approximately a year and a half being an ensign?

A. I can't recollect when I was promoted to JG.

Q. What are your duties as an ensign aboard the USS TURNER?

A. I was sent to the TURNER as a surplus officer in the engineering division, titled main propulsion assistant.

Q. And as a surplus officer in the engineering division what type of duties did you perform?

A. The Engineering Department on the destroyer has the engineer officer, the damage control assistant. And since the Navy felt that they needed more attention to the main engineering spaces as main propulsion assistant I was in the engineering spaces almost continuously.

Q. Were you responsible for performing any mechanical work in the Engineering Departments?

A. I was responsible for overseeing that it was done.

Page 66

Q. Would it be safe to say that your duties did not include actual hands-on work with the mechanical equipment; is that correct?

A. Yes. That's correct.

Q. How many Engineering Departments were there aboard the USS TURNER?

A. A destroyer like the TURNER has one Engineering Department, but that—

MR. REICH: Hold on one second. Were you saying compartment or department

MR. STOKES: Department.

MR. REICH: Okay. I'm sorry. Go ahead.

THE WITNESS: But the ship has two engine rooms and two fire rooms.

BY MR. STOKES

Q. And as an ensign, were you assigned to one particular engine room or one particular fire room?

A. I was in all, all spaces.

Q. So you would have worked in both engine rooms and both fire rooms?

A. Yes.

Q. Did you work in one particular engine room or one particular fire room with more frequency than the others?

A. Not really.

Q. When you became a lieutenant JG, did your duties change?

A. The duties were not related to the rank.

Q. What were your duties as a lieutenant JG?

A. By this time I think I was the engineer officer, the department head.

Q. What work would you perform as an engineer officer?

A. Supervising. I add very closely the work of the seamen in the engine rooms and fire rooms.

Q. Again, would it be safe to say that your work as an engineer officer did not involve personal mechanical work on any of the equipment aboard the ship?

A. No.

Q. That would be safe to say?

A. It was not safe to say that.

Q. Okay. Did your work involve any

personal mechanical work on any of the equipment aboard the ship as an engineer officer?

A. I worked with our people.

Q. But was your work limited to supervision?

A. It was supposed to be.

Q. Were there occasions when you actually had to perform work yourself on the equipment?

A. I had to show people how to.

Q. Now, the USS TURNER, it's my understanding that that ship was built in 1945. Are you aware of that?

A. At the Bath Iron Works.

Q. And at the time of construction that would be the point in time when all the pipe lines would be installed on the ship; is that correct?

A. I believe so.

Q. At the time of construction that would be the time when the equipment was installed aboard the ship; is that correct?

A. I believe so.

Q. Would you have any knowledge of any of

the maintenance history of the ship or the equipment aboard the ship prior to your boarding in 1957?

A. No.

Q. Would you have any knowledge as to the repair history of any of the equipment aboard the ship prior to your boarding in 1957?

A. I do not have any such knowledge.

Q. Would you have any knowledge as to whether any of the equipment aboard the USS TURNER during the time period you boarded the ship in 1957 was original to the ship when it was constructed in 1945?

A. I have no knowledge.

Q. And would you have any knowledge as to whether any components of any of the equipment aboard the ship at the time that you served on the ship were original to the equipment on the ship?

A. I have no knowledge.

Q. If we were to talk about the engineering compartments was the same work being performed in each of the two engineering compartments?

A. Essentially the same.

* * *

oil lines; is that right?

A. Yes.

Q. You'd have pumps for waste lines as well; is that correct?

A. Yes.

Q. Do you recall any work that was performed in your vicinity on any of the pumps aboard the USS TURNER?

A. Yes.

Q. What type of work was performed in your vicinity on the pumps?

A. We were constantly putting new stuffing in the stuffing boxes.

Q. Do you recall any other work aside from putting the stuffing in the stuffing boxes on the pumps?

A. Yes. Yes.

Q. Okay. And what type of work?

A. Well, if a pump had to be removed, then the flanges had to be cleaned and sealed.

Q. Now, you just mentioned flanges in relation to pumps. Do you recall if any of those pumps did not have flanges?

A. I do not recall.

Q. Do you recall any pumps that were connected with screw-in connections?

A. Again, I do not recall.

Q. Do you recall any pumps that were connected with solder connections?

A. There were no solder connections.

Q. Aside from replacement of the stuffing and the clean out of the flanges, do you recall any other work that was performed in your vicinity on the pumps?

A. Whatever other seals were required were —

Q. And when you say other seals, are you talking about the flanges again?

A. No. I'm talking about the innards of a pump.

Q. Did you ever personally remove any stuffing from a pump?

A. Yes.

Q. Do you recall the number of times that you personally removed stuffing from a pump?

A. No.

Q. Can you describe to me the process of removing stuffing from a pump?

A. Whereas there is supposed to be on a ship a puller to get it out our ship never seemed to have the right tools. So our sailors would use a screwdriver. And they would pry and break and we'd end up with a pile, a cloud of dust. I was there a foot or two from the sailor doing it or showing him how to do it with the best possible way. So I was exposed to all of that dust.

MS. McGARRITY: Move to strike the nonresponsive portions.

BY MR. STOKES:

Q. When the stuffing was removed from the pumps, do you recall what color that stuffing was?

A. No.

Q. Do you recall any writing on any of the stuffing that was removed?

A. It was — you had particles here. You didn't have something that you could see writing on.

Q. So would I be correct in saying you couldn't see any writing on the stuffing?

A. Could not see writing.

Page 93

Q. And you wouldn't know when that stuffing was initially installed in the pump; is that correct?

A. I would not know.

Q. You wouldn't know who had installed that stuffing in the pump; is that correct?

A. Only if we had done it a few months earlier.

Q. Do you recall any instances as you sit here today when you did remove stuffing that you had previously installed?

A. I can remember several pumps that we —

Q. Since there's no writing on the old pack — or old stuffing that's being removed, do you know who manufactured any of the old stuffing materials?

A. I don't know who manufactured the packing that we removed or installed.

Q. Do you have any personal knowledge that any of the old stuffing did in fact contain asbestos?

A. I have no knowledge.

Q. And do you have any personal knowledge that the new stuffing did in fact contain

Page 94

asbestos?

A. I have no knowledge.

Q. Did you ever see any — strike that. How would you install new stuffing into the pumps?

A. Generally around the shaft that it was trying to seal.

Q. Would the new stuffing come in any sort of packaging?

A. I don't know that it did.

Q. Was the new stuffing precut?

A. Most cases, no.

Q. How thick is this stuffing that was being removed?

A. All different thicknesses and dimensions because you were dealing with all different pumps.

Q. Do you recall what the thinnest stuffing size would be?

A. No.

Q. Do you recall if the thinnest would be, let's say, approximately the size or smaller or larger than this wire I'm holding?

A. I don't know what the thinnest stuffing

was.

Q. Okay. Do you recall what the thickest stuffing would have been?

A. Again, I don't know what the thickness was.

Q. Did you ever have occasion to cut any of stuffing?

A. I had occasion once or twice to show somebody how to do it.

Q. And what would you cut stuffing material with?

A. Well, I used a utility knife, not the right way.

Q. To cut the stuffing material with a utility knife, would that just take a few seconds?

A. I don't remember.

Q. Whose job was it to perform this maintenance repair work on the pumps?

A. We had a petty officer responsible for the fire room or the engine room. He would assign this normally to one of the sailors.

Q. Do you know what trade the sailor was?

A. Well, he'd be a machinist mate or he'd

be a boiler tender.

Q. Did you ever receive any training as a machinist mate?

A. The Navy put me on this ship a surplus officer because the engineering plant was in very bad shape in 1957. The Navy sent me to the Destroyer Force Atlantic Fleet Engineering School. And I forget how many weeks it was, but it was, I suppose, eight or ten weeks or more. And we were taught not just how to operate the machinery but also how to maintain it. I probably had more training than the petty officers responsible for the spaces.

Q. Where did you go for engineering school?

A. Newport, Rhode Island.

Q. Was this when you first met up with the USS TURNER?

A. No.

Q. When did you have the engineering school?

A. I'm trying to reconstruct. It would have been the late fall, early winter of 1957, 1958.

Q. So during this eight to ten week period

during engineering school were you off of the ship?

A. Off the ship. The ship was in the Boston Naval Shipyard at that time.

Q. During engineering school did you receive any training regarding asbestos-containing materials?

A. Never mentioned them.

Q. Going back to the pumps, when you said that the flanges were cleaned if a pump had to be taken offline, how would that occur?

A. They'd be scraped. They'd be brushed, wire brushed. I don't think we had the luxury of an electric drill with a wire wheel. So they would be done manually. And this too would create a cloud of dust.

MS. McGARRITY: Move to strike the nonresponsive portions.

BY MR. STOKES:

Q. What were you scraping from the flanges and pumps?

A. The broken seal.

Q. Did you personally ever have occasion to remove one of these broken seals from a pump

flange?

A. No.

Q. Would it be safe to say you supervised others who performed the work?

A. I was right on top of the sailor doing it.

Q. When one of these broken seals is being removed, do you recall any writing on the broken seals?

A. No.

Q. Would you know who manufactured the seal that was being removed?

A. No.

Q. Would you have any personal knowledge that the seal being removed contained asbestos?

A. No.

Q. Would you have any personal knowledge as to when that seal was actually installed in the flange?

A. Again, only if we had installed it ourselves.

Q. For those that you did not install yourselves, would you have any personal

knowledge as to the date of installation?

A. No.

Q. Would you have any personal knowledge as to whether any of those seals were original to the flanges with the pumps?

A. Nope.

Q. Is it your understanding that those seals would have been replaced numerous times prior to your boarding?

A. Yes.

Q. And the same with the stuffing, is it your understanding that that stuffing material would have been replaced numerous times prior to your time on the ship?

A. Packing was always being replaced.

Q. Did you ever personally have to install a new seal in the flanges?

A. I, no.

Q. Did you ever have occasion to work in the vicinity of others who installed a new seal in the flanges of the pumps?

A. Yes. I was feet away from the guy doing it.

Q. The new seals were they preformed?

A. Yes.

Q. So the installation of the new seals would that more or less be a matter of just placing it on the flange connection and reconnecting the flanges?

A. Yes.

Q. Would there be any reason to cut any of the seal material upon installation?

A. No.

Q. Do you recall any writing on the new seals?

A. No.

Q. Do you recall any packaging for the new seals?

A. No.

Q. Do you know who manufactured any of the new seals?

A. No.

Q. Do you have any personal knowledge that the new seals contained asbestos?

A. No.

Q. You also mentioned seals of the innards of the pumps. Do you recall that testimony?

A. Yes.

Page 101

Q. And where would these seals be located?

A. Well, between the — when I say pump, I mean the pump, centrifugal pump or otherwise as what I'll call wet end and then it has a driver, normally an electric motor and the shaft would have a seal.

Q. Did you ever —

A. I should call it packing more, but anyway —

Q. Okay. So is this the same packing that we have talked about when we said stuffing?

A. Stuffing, packing.

Q. Okay. What term would you rather use, stuffing or packing?

A. Packing would be the more correct term.

Q. Okay. So when we were talking about stuffing before we were talking about packing material; correct?

A. Yeah.

Q. Did this packing material, the innards of the pump did that differ at all from the packing you had talked about earlier?

A. I can't recollect at this time. Wait a minute. The packing was different, different

Page 102

for different pumps.

Q. There would be different compositions of packing for different pumps; is that correct?

A. I believe so.

MR. REICH: Don't guess.

BY MR. STOKES:

Q. And for any of the packing of the innards of the pump, when that packing was removed, do you recall any writing on the old packing?

A. No.

Q. Do you know who manufactured any of the old packing —

A. No.

Q. — in the innards of the pump?

A. No.

Q. Do you have any personal knowledge that the old packing of the innards of the pump contained asbestos?

A. No.

Q. Would you have any knowledge as to the installation history of the old packing that was being removed from the innards of the pump?

Page 103

A. No.

Q. Would you have any knowledge that any of that packing material in the innards of the pump were original to the pump?

A. No.

Q. It's your understanding that that packing would have been changed numerous times prior to your service on the ship?

A. Yes.

Q. Do you recall any packaging for any of the new packing that was being installed on the innards of the pump?

A. No.

Q. Do you recall any writing on the new packing that was being installed on the innards of the pump?

A. No.

Q. Do you know who manufactured any of the new packing that was being installed on the innards of the pump?

Page 104

A. No.

Q. Do you have any personal knowledge that the new packing being installed on the innards of the pump contained asbestos?

A. No.

Q. Did you ever read any specifications for any of the pumps?

A. Yes.

Q. And what was the nature of these specifications?

A. Drawings, materials of construction.

Q. Were these materials that were prepared by the U.S. Navy?

A. Or by the pump manufacturer.

Q. Do you recall the mention of asbestos in any of the materials you reviewed in relation to pumps?

A. I never saw the word asbestos relating to any of the pumps.

Q. We have now talked about the packing material and the seals that were used in the flanges of the pumps. Do you associate asbestos with any other work performed on the pumps?

A. No.

Q. And as we talked about earlier, you don't know if any of that work actually did involve the use of asbestos; is that correct?

Page 105

A. I do not know.

Q. Do you know who manufactured any of the pumps aboard the USS TURNER?

A. There were a number of manufacturers.

Q. As you sit here right now do you recall any of those names?

A. DeLaval, I think it was Warren. There was another one that was quite widely used.

MR. REICH: Would it help you to look at —

THE WITNESS: Yes.

MR. STOKES: We'll get to that.

MR. REICH: Okay.

MR. STOKES: I'll go through it.

BY MR. STOKES:

Q. Right now we just want to know what you remember and then we'll go through the materials.

A. I don't — there were three primary — Buffalo was the third I'm pretty sure.

Q. Do you recall a Worthington pump?

A. I recall the Worthington label.

Page 106

Q. Do you recall any other pump manufacturers as you sit here without looking at those materials?

A. No.

Q. Sir, we've now talked about the boilers, the turbines, the pumps, the electrical equipment, the electrical generators, the diesel generators. Aside from that equipment, do you recall any other equipment on which repair or maintenance work was performed in your vicinity?

A. I certainly was responsible for other equipment, but I don't recollect right now.

Q. And do you associate asbestos with any of your other work performed aboard the USS TURNER other than what we have talked about?

A. No.

Q. It's my understanding that in the USS — strike that. It's my understanding that in the U.S. Navy there's a chain of command?

A. Yes.

Q. I've heard it said before the right way, the wrong way and the Navy way. Are you familiar with that term?

Page 107

A. I've heard it.

Q. Essentially when you serve in the USS — strike that. I'm sorry. When you serve in the U.S. Navy, you have to abide by the Navy orders; is that correct?

A. Yes.

Q. Within that chain of command the orders come down; correct?

A. Yes.

– – –

(Whereupon, there was an interruption in the deposition.)

– – –

MR. STOKES: I'll object to that.

MR. REICH: You ain't seen nothing yet.

BY MR. STOKES:

Q. And if you didn't abide by the orders you would be punished; is that right?

A. Yes.

Q. Did you ever have occasion when you refused an order?

A. No.

Page 108

Q. What would happen if you did refuse an order?

A. Well, certainly there would be no promotion.

Q. And essentially every aspect of your life in the U.S. Navy is regimented and dictated by the U.S. Navy; is that right?

A. Yes.

Q. The Navy, they instruct you when to wake up; is that right?

A. Yes.

Q. They instruct you when to go to bed; is that right?

A. No.

Q. They tell you when lights are out; is that right?

A. Yes.

Q. They tell you when you are going to eat your meals; is that correct?

A. Yes.

Q. They dictate what work you perform on the ship; is that correct?

A. Yes.

Q. They dictate how to perform your work on

the ship; is that correct?

A. Yes.

Q. The Navy determines what materials you will be using to perform your work; is that correct?

A. Yes.

Q. In order for you to leave the ship or board the ship you have to salute the flag; is that correct?

A. Yes.

Q. You really can't do much in the U.S. Navy without permission from the Navy; is that right?

A. Yes.

Q. Did you look to the Navy when it came to issues of health and safety?

A. Yes.

Q. You relied on the Navy when it came to your health and safety; is that right?

A. Yes.

Q. If the Navy had knowledge of any dangerous products or activity, you relied on the Navy to convey that knowledge; is that right?

Page 110

MR. REICH: Objection. You can answer.

THE WITNESS: Yes.

BY MR. STOKES:

Q. Is it your understanding that any material or product that went aboard the USS TURNER was determined by the U.S. Navy?

MR. REICH: Object. Go ahead. You can answer.

THE WITNESS: Yes.

BY MR. STOKES:

Q. And that the U.S. Navy specified the use of any materials used aboard that ship; is that right?

A. Specified and procured.

Q. And nothing could go aboard that ship without the allowance of the U.S. Navy; is that right?

A. Yes.

Q. Were you ever present aboard the ship when it underwent any overhauls?

A. Yes.

Q. And it's my understanding when a ship undergoes overhauls it goes into a shipyard;

is that right?

A. Yes.

Q. And then the yard birds come out and they rip everything out of the ship; is that correct?

A. Yes.

Q. Were you present when the yard birds worked on the ship?

A. I was present on the rip out in Boston and then again in Brooklyn. I never was present when things were put back together.

Q. When these rip-outs were performed in Boston and Brooklyn, would it be safe to say that yard birds would go in and remove all of that pipe covering from the ship?

MS. McGARRITY: Objection, form.

THE WITNESS: I can't recollect what was done with piping.

BY MR. STOKES:

Q. These rip-outs on the ship, that's adusty process, is it not?

A. Very dusty.

Q. That would be one of the dustiest

processes aboard the ship, is that right?

A. Yes.

Q. And it would create clouds of dust; is that right?

A. Yes.

Q. I've heard people say that when rip-outs are performed it's similar to — it creates a situation where it looks like it's snowing. Would you describe it that way?

A. Well, I would suggest that when you removed, say, a pump for maintenance, removing of the insulation, assuming this was an insulated pump, would create a cloud and so you would have clouds of dust.

Q. Now, you didn't mention insulation in relation to the pumps earlier. Was there insulation on any of the pumps?

A. Oh, sure.

Q. Would it be safe to say that not all the pumps were insulated?

A. A cold water service pump doesn't need to be insulated.

Q. So you would have insulated and noninsulated pumps; right?

A. Yes.

Q. And the Navy would determine which pumps were to be insulated and which pumps were not to be insulated; correct?

A. The original design determined that.

Q. And those are designs that are specified by the Navy; correct?

MR. REICH: Objection.

BY MR. STOKES:

Q. If you know.

A. I have no way to know.

Q. Were you ever present when insulation was removed from a pump?

A. Oh, yes.

Q. Do you recall any writing on any of the old insulation removed from a pump?

A. No.

Q. Do you know who manufactured any old insulation removed from a pump?

A. No.

Q. Do you know when that insulation was installed on the exterior of the pump?

A. No.

Q. It's your understanding that the

insulation of pumps that occurs after the pump is delivered and installed on the ship; correct?

A. Yes.

Q. And the insulation work is performed by members of the U.S. Navy; is that correct?

A. Yeah, either members of the crew or members of the supporting shipyard.

Q. So you wouldn't know if any of that insulation was original insulation that was installed at the shipyard or whether it was installed by other crew members; is that correct?

A. Yes.

Q. Do you have any personal knowledge that any of the old insulation on the pumps contained asbestos?

A. No.

Q. Did you ever personally install new insulation on any of the pumps?

A. No.

Q. Were you ever present when others installed new insulation on the pumps?

A. Yes.

Page 115

Q. Do you recall any packaging for the new insulation?

A. No.

Q. Do you recall any writing on the new insulation?

A. No.

Q. Do you know who manufactured any of the new insulation?

A. No.

Q. Do you have any personal knowledge that the new insulation contained asbestos?

A. No.

Q. Do you know who supplied any of the new insulation?

A. No.

Q. Do you know who supplied any of the materials that were used aboard the USS TURNER?

A. No.

Q. It's my understanding that aboard these Naval ships your sleeping quarters they were bunks; is that correct?

A. Yes.

Q. How many bunks were there aboard the USS

Page 116

TURNER?

A. Well, first of all, we had two officers' wardrooms. The engineer officer's stateroom was in the aft of wardroom. So there were probably four or five other officers in the aft of wardroom with me.

Q. Were there bunks in the aft of wardroom?

A. I guess we'd call them bunks.

Q. Were the beds on different levels of the wardroom?

A. I think they were — yeah. They were two high.

Q. Do you recall which level you slept on in the wardroom?

A. Well, when I was an engineer officer, I slept in the lower bunk in the engineer officer's stateroom.

Q. Okay.

A. And the bunk above me stayed empty.

Q. Was there insulated pipe in the stateroom?

MS. McGARRITY: Objection, form.

THE WITNESS: I don't know.

Page 117

BY MR. STOKES:

Q. Where did you — where did you sleep before you received a promotion and went to the stateroom?

A. In the aft of wardroom.

Q. Were there insulated pipes in the aft of wardroom?

MS. McGARRITY: Objection, form.

THE WITNESS: I don't know.

BY MR. STOKES:

Q. Did the U.S. Navy ever warn you regarding the hazards of asbestos?

A. Absolutely not.

Q. If the U.S. Navy had known the hazards of asbestos would you have expected them to give you a warning?

MR. REICH: Objection. I object to the form of that. I mean, he has no way of guessing what the Navy would tell him based on what they knew or didn't know. I mean, that's pure speculation.

MR. STOKES: It is a discovery deposition.

* * *

JOHN B. DeVRIES	:	COURT OF COMMON
and	:	PLEAS
ROBERTA G.	:	PHILADELPHIA COUNTY
DeVRIES,	:	
h/w	:	
Plaintiffs	:	DECEMBER TERM, 2012
	:	
vs.	:	
	:	NO. 3661
ALLEN-BRADLEY	:	
COMPANY, et al.		ASBESTOS CASE
Defendants		

WEDNESDAY, JANUARY 16, 2013

Videotaped Discovery

Deposition of JOHN B. DeVRIES, taken pursuant to notice, held at the offices of Veritext National Court Reporting Company, 1801 Market Street, Suite 1800, Philadelphia, Pennsylvania on the above date, beginning at or about 10:15 a.m., before Kathleen Woods Logue, Professional Reporter and Notary Public there being present.

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* * *

insulation on any of these drive turbines, you don't know, do you?

MR. REICH: And I object. He's already answered that a number of times.

BY MR. KATTNER:

Q. And you have no information that General Electric supplied any of the external insulation on any of these turbines, do you, you yourself?

A. I have no personal information.

Q. And the same thing, you have no knowledge that Westinghouse supplied any of that insulation?

A. I have no personal information to say Westinghouse supplied it.

Q. And whether the Navy specs say it was supplied bare metal or not that's something the Navy specs will tell us; is that correct?

MR. REICH: Objection, asked and answered.

MR. KATTNER: Okay. Thank you.

MR. REICH: I think this might be a good time to break for lunch.

Page 406

THE VIDEOTAPE OPERATOR: The time is 12:07. We're going off the video record.

(Whereupon, a lunch break was taken at this time.)

THE VIDEOTAPE OPERATOR: The time is 1:06. We are back on the video record.

EXAMINATION

BY MS. ZUMSTEG:

Q. Good afternoon, Mr. DeVries. My name is Amy Zumsteg from the law firm of Leader and Berkon in New York. My questions to you pertain to DeLaval pumps. Okay?

A. Yes.

Q. All right. Did you supervise work on a DeLaval pump —

THE COURT REPORTER: I'm sorry. I can't hear your question.

BY MS. ZUMSTEG:

Page 407

Q. Did you supervise work performed on a DeLaval pump?

A. Yes.

Q. And did you personally perform hands-on work on a DeLaval pump?

A. Maybe occasionally.

Q. Over the three years of work on the USS TURNER, how many times would you say you performed hands-on work on a DeLaval pump?

A. Only a handful. And that would be to demonstrate to a seaman how to do something.

Q. And your work involving DeLaval pumps was only aboard the USS TURNER; is that correct?

A. Yes.

Q. How did you know that a pump was manufactured by DeLaval?

A. You had many — DeLaval had many pumps on the TURNER. Several had nameplates, several

had manuals, operating instructions from DeLaval. We had to know who the pump producer was of course.

Q. How many DeLaval pumps were on the ship?

A. Many pumps. I can't recollect how many.

Page 408

Perhaps several dozen. DeLaval was the major supplier of pumps for this class of destroyer.

Q. Where were they located on the ship?

A. I remember condensate pumps, auxiliary condensate pumps, feed pumps I believe, I believe even some oil booster pump. There were a wide array of applications and uses.

Q. They were in the engineering spaces; is that correct?

A. I'm referring to those that were in the engineering spaces.

Q. Can you be more specific than that?

A. Well, the engineering spaces would be the engine rooms, fire rooms.

Q. So both of those types —

A. Yes.

Q. — of rooms?

A. Yes. Yes. Yes.

Q. Of the several dozen that you recall, how many of those did you personally work on?

A. Of the several dozen, I was present for supervising and sometimes showing how to do the work on those pumps.

Q. On all several dozen?

Page 409

A. My responsibility involved making — keeping the ship running and needed those pumps to keep running. And our crew unfortunately was not well trained. So I stood on top of people while they were working on pumps, as I said, occasionally showing them what to do, but always supervising what was being done.

Q. And what was being done to the DeLaval pumps?

A. Many times the pumps had to be repacked. No fault of DeLaval, but the mounting platforms, or whatever you call them, had corroded. This was not a new ship. This was an old ship. And the bottom, the result was misalignments. And packing was just a constant issue on the TURNER.

Q. You said occasionally you performed hands-on work?

A. In this — let's talk about repacking. Properly you have a tool to pull out the old packing. No such tool existed on the TURNER. We would use a screwdriver. Excuse me. And I would on occasion show people how to use that

Page 410

screwdriver to pry or chop or break up the packing.

Q. How long did that sort of work take?

A. It depends on the condition of the pump.

Q. Would it be under an hour?

A. It could be.

Q. Do you remember what drove DeLaval pumps?

A. Some were driven by steam turbine. Some were driven by electric motors. I recollect that the main condensate pumps were turbine driven and turbine supplied by DeLaval as well as the wet end of the pump.

Q. Did you perform work on DeLaval turbines?

A. As a part of the assembly, yes.

Q. Do you recall what flowed through the DeLaval pumps, the various types?

A. Varied on the application. I just spoke of condensate pumps, feed pumps would — and I remember there was an oil pump. And recognize that I didn't do the work except the exceptional time when I was showing someone.

Q. Were there some pumps that ran cold

applications?

A. Cold?

Q. Yes.

A. That we had some pumps that ran, for instance, water service for the portable water service.

Q. And that would be ambient temperature water?

A. That would be ambient. I can't say whether that was a DeLaval pump or somebody else's.

Q. Were the DeLaval pumps similar in size?

A. They varied by the application. They were both vertical and horizontal.

Q. Do you know the maintenance history of DeLaval pumps, the maintenance history of them?

A. The ship had, as it should, a maintenance card on each piece of equipment. The Engineering Department would maintain those cards. They were reasonably up to date.

Q. Do you happen to know whether the components in the pumps you worked on were original to the equipment?

Page 412

A. I have no knowledge, but I'm sure, for example, the packing that might be replaced so frequently was not original.

MS. ZUMSTEG: Thank you, sir. Those are all my questions.

THE WITNESS: Thank you.

MS. ZUMSTEG: Thank you.

MR. REICH: Okay. Go off the record for a second.

THE VIDEOTAPE OPERATOR: 1:14, we're going off video record

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THE VIDEOTAPE OPERATOR: The time is 1:15. We're back on the video record.

- - -

EXAMINATION

- - -

BY MR. REICH:

Q. Mr. DeVries, you have testified that there were as many as a couple of dozen DeLaval pumps on the TURNER. How frequently would it be necessary

to replace the packing on any one of those pumps, on any DeLaval pump?

Page 413

A. Well, each pump was a separate entity. I — I mentioned earlier that packing was a problem probably because the pumps and the driver could come out of line and out of line because the support was corroded, bent, abused, whatever.

Some of those pumps it seemed like we were repacking constantly. Now, again, I — I didn't do that. I stood over the person doing it. And a pump that was giving so much trouble I intentionally stayed through most of the process.

And, of course, this process, this removal of packing created a cloud of dust. And I was breathing the dust because we were trying to determine by close inspection and close supervision what was causing this constant leak.

Q. And what would have been used to pack the high pressure or high temperature DeLaval pumps?

A. High pressure, high temperature insulating materials, thermal insulate — packing material, whatever, would have been I

Page 414

would guess — I can't say I guess. The industry would use asbestos.

Q. Okay. And tell us how with the screwdriver the packing would be removed, the old packing? And why was it necessary? What would happen to the packing that caused it to need to be removed?

A. Well, you wouldn't repack unless it was leaking. And to remove the packing, I said earlier, we

didn't have any time I was on that ship, a proper removal tool, lost, whatever. We would use a screwdriver and chip, chop, I should say, pry loose the packing which would break up and create dust.

Q. And what would happen with that old packing that was being removed?

A. It'd be discarded.

Q. Where did the new packing come from?

A. From the ship storeroom.

Q. And what would your training and knowledge have indicated the composition of that new packing for the DeLaval pump would have been?

A. My knowledge at the time was that the

high temperature applications would require asbestos.

Q. And how did the new packing come? Was it precut or did it need to be somehow adjusted to fit into the particular pump?

A. There were a number of different packings for different pumps. Some may have been precut. More commonly it was a rope that wrapped.

Q. And how would you get the right size for that particular pump?

A. Cut off a piece.

Q. What would you cut it with?

A. Some sort of a knife.

Q. And when you cut it with the knife, did that cause any kind of debris or dust?

A. Not much.

Q. Now, would it be necessary to take a pump or a turbine off line or do something with it before you opened it up and took the packing out?

A. Well, you'd have to —

DEFENSE COUNSEL: Objection, leading.

Page 416

THE WITNESS: — remove the insulation. Assuming we're working with a hot fluid and a steam driven pump, you would have to remove the insulation from both the driver and the pump.

BY MR. REICH:

Q. So what kind of insulation would be on the DeLaval driver or pump? When you say driver you mean turbine?

A. Turbine or electric motor.

Q. Or electric motor. Okay.

A. I recollect on several of these larger pumps there was a blanket. And otherwise it would be I guess a paste type insulation.

Q. What would happen when — I'm sorry.

A. That would create, that would create a cloud of dust.

Q. Okay. What would?

A. The removal of the — the removal of the insulation.

Q. And did you breathe that dust?

A. Of course.

DEFENSE COUNSEL: Objection.

THE WITNESS: I was as close

Page 417

to the pump — closer than I am to you right now. You couldn't help breathing it.

BY MR. REICH:

Q. Indicating about a foot or less?

A. Yeah. You couldn't help but breathe it.

Q. Now, how many seals or gaskets would be on a DeLaval pump on average?

A. Well, you would have an input and an output on the fluid end. And so that would give you two seals.

Q. Okay.

A. Two gaskets for the lines.

Q. Now, how frequently would it be necessary to change the seals or gaskets on the DeLaval pumps?

A. Since the pumps probably had alignment issues, the gasket sometimes had to be changed frequently also. I didn't make that clear. Let me start again. The gaskets would be changed when there was a leak. The leak may have occurred because of a misalignment caused by this supporting structure. At any rate, some pumps we had to replace those gaskets a number of times and some not so often.

Page 418

Q. When you needed to replace those gaskets, was it necessary to disturb the outside insulation?

DEFENSE COUNSEL: Objection.

THE WITNESS: Not to replace the gaskets, but the insulation was usually removed before replacing the gaskets for the flanges.

BY MR. REICH:

Q. Okay. And describe for us how the gaskets for the flanges on the DeLaval pumps and turbines would have to be done?

A. The flanges were pulled apart. In doing so the gasket would leave fragments, would break and leave fragments on both surfaces. To remove the fragments you would scrape and wire brush the surfaces until they were clean.

Q. And what would happen when somebody wire brushed the surface?

A. Create dust.

Q. Did you breathe it?

A. Again, if you're looking down here to see how clean it is, you're in the cloud of dust.

Page 419

Q. Why was it so important that the flange be perfectly cleaned from the gasket material that had stuck to it?

DEFENSE COUNSEL: Objection.

THE WITNESS: If it wasn't clean, it wouldn't seal properly. The reinstallation wouldn't seal properly.

BY MR. REICH:

Q. And do you remember whether the replacement gaskets were from a sheet gasket material or were they precut, if you remember?

A. I don't remember.

Q. Okay. With regard to the old pieces of gasket that were being removed and chipped off and wire brushed, what would happen to those?

DEFENSE COUNSEL: Objection.

THE WITNESS: Be discarded.

BY MR. REICH:

Q. Well, where would they end up while they were being removed?

A. Probably in a little pile of trash alongside where the person was working.

Q. And whose job was it to sweep that stuff up and get it out of there?

Page 420

A. I guess the sailor who did the work cleans —

Q. All right.

A. — was trained to clean up after himself.

Q. Did the sweeping of these asbestos gasket pieces or packing pieces, what would happen when that was swept up?

DEFENSE COUNSEL: Objection, leading.

THE WITNESS: I can't of personal knowledge be certain. You get some dust. How much? By this time I was no longer on the scene.

BY MR. REICH:

Q. Okay. Had you ever seen the material swept up ever?

DEFENSE COUNSEL: Objection, calls for speculation.

THE WITNESS: I can't recollect it.

BY MR. REICH:

Q. Okay. That's fine. Do you know if any of the DeLaval pumps were serviced during any

Page 421

of the visits either to the Boston or Philadelphia or New York Shipyards, Brooklyn?

A. I was not involved in the Philadelphia Shipyard work. In the Boston and the New York Naval Shipyard work, I believe that several of the DeLaval pumps were actually removed from the ship, but they certainly had shipyard service in both yards.

Q. And what would happen before those DeLaval pumps could be removed from the ship?

A. Sometimes the insulation was removed. Since the yard workers did it, I wasn't present for much of that — for the removal of a pump if the pump was removed. If they're serviced on — were serviced on board without removal, it would be very much as I have described ship work personnel doing it except they would do it with the proper tool.

Q. Were you present when the DeLaval pumps that had been removed from the ship were put back on?

A. No.

Q. When you got back to the ship, did you see the DeLaval pumps back in place?

Page 422

A. Well, in both cases, yes.

Q. Did you see any warning labels with regard to the dangers of breathing in asbestos on any of the DeLaval pumps or turbines?

A. I did not.

Q. Did you see any warning labels or warnings with regard to the dangers of breathing in asbestos on any of the DeLaval manuals?

A. I don't recollect seeing any.

MR. REICH: I have no further questions.

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EXAMINATION

– – –

BY MS. ZUMSTEG:

Q. Mr. DeVries, I have a few follow-up questions. Did you ever read a DeLaval manual?

THE VIDEOTAPE OPERATOR: Excuse me. Would you mind putting your mike on?

BY MS. ZUMSTEG:

Q. Did you ever read a DeLaval manual?

Page 423

A. I read portions at least of a DeLaval manual.

Q. And you replaced packing when the pump was leaking; is that correct?

A. Yes.

Q. Was that packing wet then?

A. Some was damp. Some was not.

Q. And you replaced gaskets on the pumps when they were leaking; correct?

A. Yes.

Q. And were those gaskets wet?

A. They were usually wet.

MS. ZUMSTEG: That's all I have.

MR. REICH: I have nothing further.

THE VIDEOTAPE OPERATOR: The time is 1:29. We're going off the video record.

MS. ZUMSTEG: Thank you, sir.

THE WITNESS: Thank you.

MR. MASTROIANNI: Alan, I may have a couple after anyone on the phone has questions.

Page 424

MR. REICH: Okay. If it's just a couple. I'm not going to have everybody going again.

MR. MASTROIANNI: Yes. Okay.

MR. REICH: Is there anybody on the phone who wants to ask any questions?

MR. PITT: No.

MR. REICH: Is there anybody else over here who wants to ask product questions? All right. Go ahead. Why don't you go if you just have a couple minutes. That's fine. And then we'll go into the general medicine and stuff.

THE VIDEOTAPE OPERATOR: The time 1:30. We're back on the video record.

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EXAMINATION

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BY MR. MASTROIANNI:

Q. Good afternoon, Mr. DeVries. Tom Mastroianni again. I asked you some questions yesterday pertaining to the Foster Wheeler condensers on board the TURNER. There was just a few things I wanted to — I needed to

* * *

JOHN B. DeVRIES and ROBERTA G. DeVRIES, h/w	:	COURT OF COMMON PLEAS
	:	PHILADELPHIA COUNTY
Plaintiffs	:	DECEMBER TERM, 2012
vs.	:	
	:	NO. 3661
ALLEN-BRADLEY COMPANY, et al.	:	ASBESTOS CASE
Defendants		

THURSDAY, JANUARY 17, 2013

Videotaped Deposition of JOHN B. DeVRIES, taken pursuant to notice, held at the offices of Veritext National Court Reporting Company, 1801 Market Street, Suite 1800, Philadelphia, Pennsylvania on the above date, beginning at or about 10:15 a.m., before Kathleen Woods Logue, Professional Reporter and Notary Public there being present.

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* * *

A. We have four grandchildren.

Q. What are their names?

A. Alexandra, Taylor, Daniel and Ryan.

Q. And do you enjoy spending time with them when you are able to?

A. We try and spend as much time as we can.

Q. Where do they live?

A. They live in California.

Q. And did you travel to California to visit with your children and your grandchildren?

A. We have done so, yes.

Q. Okay. And sometimes they come —

A. Sometimes they come east.

Q. So you told us a little bit earlier that after you graduated from Cornell with your Bachelor's degree in chemical engineering you served in the military. Can you tell us a little bit about what that service involved?

A. Upon commissioning I was ordered to the ship the USS TURNER DDR-834.

Q. What kind of ship is the USS TURNER?

A. The TURNER is a destroyer that had been outfitted to be a radar picket destroyer

operating in the van of a carrier task group.

MR. REICH: Okay. Now, we're going to go off the record for just a moment here.

THE VIDEOTAPE OPERATOR: The time is 10:24. We're going off the video record

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(Whereupon, a discussion was held off the record.)

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THE VIDEOTAPE OPERATOR: The time is 10:25. We're back on the video record.

BY MR. REICH:

Q. Okay. Mr. Devries, we've got a picture of a ship. Can you tell us what you see there?

A. I see a destroyer with the number 834 which would be the TURNER.

Q. And is that the ship that you were stationed to when you entered the service?

A. I was on the TURNER all three years.

Q. And when you say three years, when did you first get on the TURNER and when did you

last get on the TURNER? Or I'm sorry. When did you first get on the TURNER and when did you leave?

A. I reported I believe it was June of 1957. As I said, upon commissioning which was the same day as graduation at Cornell, I was directed to the TURNER. Maybe with a couple days of travel time. I left the TURNER in June of 1960.

Q. When you first got on the TURNER, what was your rank and what were your responsibilities in June of 1957?

A. The rank was ensign. The billet was main propulsion assistant. The responsibilities were to improve the operations of the engine, engine rooms and fire rooms, boiler rooms.

Q. Okay. Now, that sounds like a big responsibility. I'm going to ask you to try and break that down for us a little bit. First of all, let's talk about engine rooms. How many engine rooms were there on the TURNER?

A. There were two engine rooms on the

TURNER as any Gearing class destroyer.

Q. Okay. When you say Gearing class, were there a certain number of destroyers that were made pretty much the same way at around the same time?

A. Yes.

Q. Okay. And they're named after —

A. When I said Gearing class, I presume Gearing was the first of the string.

Q. And are they usually named after officers or —

A. I don't know how the Navy named ships, but they do name them after individuals.

Q. Okay. Now, you said that there are two engine rooms. What kind of equipment was in those engine rooms that came under your responsibility as main propulsion assistant?

A. The TURNER had two drive shafts turning two propellers. One is turned by the — the turbine in one engine room, the other is turned by the turbine in the aft of engine room.

Q. Now, aside from the turbine in the engine room, what other kinds of equipment was

in there on the TURNER?

A. Many pumps servicing the condensers and feed pumps and such, electro — electrical generating plant, switchboard, electrical switchboard.

Q. Was there any difference in the type of equipment as you have started to describe for us between

the two separate engine rooms or was it pretty much a mirror image?

A. They were designed to be mirror images.

Q. Approximately how big was the engine room? Are you able to estimate or guesstimate for us?

A. I estimate it was maybe 30 to 40 feet more or less square.

Q. Okay. And at any given time how many men would be working in the engine rooms to maintain the equipment and make sure that the TURNER was running properly?

A. If we were underway you would have a normal watch. If we were in port doing maintenance all of the machinist mates would be in their respective engine room.

Q. And approximately how many would be in

one engine room at a time or could there be, if you can estimate for us? If not —

A. I can't really, can't really answer that. And an estimate would be quite wide.

Q. Okay. Now, was it necessary under your responsibility to see that the equipment in those two engine rooms were running properly?

A. Yes.

Q. What would happen and what would you have to do to make sure that that equipment was maintained, repaired properly?

A. We would initiate a repair to the equipment, supervise their repair and because unfortunately our

crew was relatively inexperienced sometimes help and show them how to do the portions of the repair.

Q. Again, can you briefly describe for us some of the repairs that you supervised in the two engine rooms on the TURNER during the three years that you were stationed there?

A. Most all of the repairs in terms of time were on pumps, various types of pumps.

Q. And what kind of repairs had to be done to the pumps while you were there?

Page 24

A. Well, they had to have shaft gas – not gasketing. I call it stuffing boxes refilled, but —

Q. Is that the packing material?

A. Packing material.

MR. WEINBERG: Objection.

THE WITNESS: Packing —

MR. WEINBERG: Let's go off the video for a second.

THE VIDEOTAPE OPERATOR: The time is 10:32. We're going off the video record.

MR. WEINBERG: I let it go with leading questions during the preliminary, but now we're going into the product ID. SO I'm going to continually object to the leading questions, Alan. So it's your choice on how you want to proceed.

MR. REICH: That's fair. Thank you. We can go back on the record, please.

THE VIDEOTAPE OPERATOR: The time is 10:33. We are back on the video record.

Page 25

BY MR. REICH:

Q. So what materials would have to be replaced or repaired on the pump?

A. Packing seals and also the gaskets between the pump and the line coming to it, flanges, flanges.

Q. And when you say a line, what do you mean by a line?

A. Well, pumps move liquids and liquids come through piping I guess I would call it. And these were generally connected with flanges.

Q. Okay. And if you could explain to the ladies and gentlemen of the jury, please, first what a flange is?

A. A metal, a flat metal face, it's a metal device attached to the pipe.

Q. What's the purpose of a flange?

A. And then there's a flange on, say, the pump on the other side. It's a way — it's a way to connect the piece of equipment against, say, a pump into the system.

Q. And you said that there were gaskets. How would the gaskets — where would the

Page 26

gaskets be with regard to the flanges?

A. The gasket is between the two metal faces.

Q. And what would happen when it was necessary to — well, strike that.

Why would it be necessary to do anything with those flanges and those gaskets?

A. Well, either to remove the unit itself or just to correct for leakage.

Q. And describe for us, please, the process in replacing, removing and replacing the gaskets that went between the flanges?

A. When the two flanges were broken apart the existing gasket would break.

Q. And what would happen to the pieces?

A. And the pieces would fall, but also they would adhere to the flange faces requiring they'd be scraped, wire brushed, however removed.

Q. And what would happen when the men would scrape and wire brush these pieces of gasket off the flanges?

A. They would become airborne dust.

Q. Okay. And how close were you to those flanges when that was being done?

A. Right next to the sailor doing the work.

Q. And did you breathe that dust?

A. I was in the cloud.

Q. Now, why was it important to remove these pieces of gasket that stuck to the flange? Why couldn't they just be left there?

A. Because when the unit was reassembled, the flanges were reassembled they — well, they'd leak. The gasket needed a clean surface.

Q. And was this a process that had to be done every time a gasket needed to be replaced?

A. Whenever a gasket was replaced the cleaning process was required.

Q. Now, you also mentioned other — another process that had to be done with regard to the pumps.

A. I mentioned the need for repacking pumps.

Q. And what was the — what were the pumps repacked with?

A. Packing materials. Consider as an example a rope material.

Q. Okay. And what was the process, if you can describe for us, for removing and replacing the packing material on the pumps?

A. The process would be to pull the old packing out. Unfortunately, the TURNER never seemed to have a packing pulling tool as they should. So the process became one of chipping and twisting and prying with a screwdriver.

MR. WEINBERG: Objection. Move to strike those portions of the answer nonresponsive to the question.

BY MR. REICH:

Q. Why was it difficult to remove the packing material on the pumps on the TURNER?

A. Not limited to the TURNER it would — it would be sort of hardened around the, the shaft.

Q. Okay. And what would happen when the packing material was disturbed and picked out with the screwdriver as you've described?

A. Again, the packing material would break up much like the gasket and there would be

airborne dust.

Q. Did you breathe that dust?

A. Yes.

Q. How close were you to this process when this was being done?

A. If I was looking to see what was going on, I could be just a foot away from the — from the packing.

Q. How frequently would gaskets and packing need to be replaced on the various pumps?

A. I can't answer quantitatively, but the TURNER had a lot of difficulties with its pumps. And so it was a frequent occurrence.

Q. Approximately how many pumps would you say were on the TURNER that you were responsible for?

A. Again, I can't answer quantitatively, but there were dozens of pumps.

Q. Aside from the pumps, what other equipment was in the engine room?

A. Well, did we start with condensers, the main condenser and the condensate pumps from the condenser, the electric generating plant.

Q. Okay. With regard to the pumps, let's

step back for a second, what kind of materials were going through these pumps, the various pumps?

A. Everything from water, hot water to, not in the engine room necessarily, in the fire rooms, hot oil, hot fuel oil, hot bunker oil.

Q. Okay. And did you receive any kind of training as to what kinds of materials either for the gaskets or the packing that would be required for hot applications?

MS. McGARRITY: Objection, form.

THE WITNESS: Training, and I would say for all engineers, not just Navy people, at that time said you would use asbestos for high temperature applications.

MR. REICH: Can we go off the record for a second?

THE VIDEOTAPE OPERATOR: The time is 10:41. We're going off the video record

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(Whereupon, a discussion was held off the record.)

Page 31

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THE VIDEOTAPE OPERATOR: The time is 10:41. We are back on the video record.

BY MR. REICH:

Q. Okay. And you started to describe for us some of the other equipment in the engine room. What was the equipment that ran the propeller shaft?

A. This was the main turbine.

Q. The main turbine. And what powered that main turbine?

A. High pressure steam from the boiler.

Q. And do you — can you tell us whether there was the need for any kind of insulation on those turbines?

DEFENSE COUNSEL: Objection, form.

THE WITNESS: Any hot surface either to maintain the efficiency of the turbine or to protect a crew member from burns would be insulated.

BY MR. REICH:

Q. So how would you relate that to the

turbines?

A. Well, the turbines were insulated just as some pumps were insulated.

Q. Was it ever necessary to disturb the insulation that was on those turbines in the two engine rooms on the TURNER while you were present?

A. Yes.

Q. And can you tell the ladies and gentlemen of the jury what might require that or what did require that?

A. Periodic inspections required by the Navy required opening and checking, for example, thrust bearing clearance, periodic — well, and sometimes there would be some repairs required.

Q. And what would happen? How would you get to the equipment down to the metal?

A. You would remove the insulation.

Q. What would happen when that insulation was handled or removed?

A. As in any time with insulation it would become dust. There would be considerable dust.

Page 33

Q. And did you breathe that dust?

A. Yes.

Q. How close were you to the turbines when they were being worked on?

A. A requirement of the engineer officer is to be at the turbine whenever it is opened and worked on.

Q. How frequently would that happen over the three years that you were assigned and on the TURNER?

A. I suppose maybe three to six times.

Q. Is that in each turbine?

A. Yes.

Q. And how many turbines were there altogether on the —

A. Two turbines, one powering the starboard shaft, one powering the port shaft.

Q. And for the ladies and gentlemen of the jury who don't know the difference between starboard and port, can you tell us if we're facing the front, if we're on the ship facing forward which is starboard and which is port?

A. Right side is starboard.

Q. Okay. And the left side is?

Page 34

A. Port.

Q. Okay. Now, you also talked to us about other equipment. You had the pumps that were in the fire

room and the turbines. Were the pumps — I don't remember if I asked you this question. I apologize if I did. What were the temperatures on the pumps, some of them?

A. Well, the range was from fresh water service which would be room temperature to very hot water condensate from the condenser.

Q. Okay. And the hot — the pumps that had hot applications, did they need any special treatment that the cold water pumps might not have needed?

A. As I stated earlier, anything that is hot needs to be insulated either through enhance the — or maintain the efficiency of the unit or to protect the crew from damage, from burns.

Q. And what materials would have been used, to your knowledge?

A. These were insulation, sometimes blankets, sometimes mud.

Q. And that would have been made out of

what for the high temperature applications?

DEFENSE COUNSEL: Objection.

THE WITNESS: When the TURNER personnel made up mud in repairing insulation it was asbestos mixed with water.

BY MR. REICH:

Q. And did that process make dust?

A. That made some dust also.

Q. How close were you when that was being done?

A. The mixing was minor, relatively minor. And, generally, I didn't pay too much attention to it.

Q. Okay. Well, at that time did you have any knowledge about the dangers of asbestos?

A. I had no knowledge of the dangers of asbestos.

Q. Okay. In fact, did any of the equipment on the TURNER that had asbestos either in it or on it have any kind of warning labels with regard to the dangers of breathing in asbestos?

DEFENSE COUNSEL: Objection, form.

Page 36

THE WITNESS: I do not recollect any warning labels on any equipment.

BY MR. REICH:

Q. And what would you have done if you had seen warning labels that said breathing in asbestos is dangerous, wear a mask?

DEFENSE COUNSEL: Objection.

DEFENSE COUNSEL: Objection, form.

BY MR. REICH:

Q. You can answer.

MR. WEINBERG: Calls for speculation.

THE WITNESS: I answer. I would have made sure that all of us were wearing a mask.

BY MR. REICH:

Q. Is there any other equipment in the engine rooms that required asbestos that we haven't talked about yet?

MR. SKINNER: Objection, form, lack of foundation.

THE WITNESS: Electrical equipment had insulators and in that — and

Page 37

most of that was electrical equipment. This would be a phenolic plastic reinforced with asbestos.

MR. SKINNER: Move to strike, lack of foundation.

BY MR. REICH:

Q. Was it ever necessary for you to work on any of that equipment or have your men work on it in your presence?

MR. SKINNER: Objection, form.

THE WITNESS: Yes.

BY MR. REICH:

Q. And as you sit here today, do you recall any dust that was created when that electrical equipment was worked on?

MR. SKINNER: Objection, leading.

THE WITNESS: When the equipment was opened up of course there was dust. But more important I think when the phenolic molded plastic part was removed, sometimes it was difficult to remove, it had to be broken out. And I recall an instance where the plastic was broken up quite a bit.

Page 38

BY MR. REICH:

Q. Now, you also mentioned fire rooms. Can you tell the ladies and gentlemen of the jury first is there another name for a fire room? And let me start with that. Is there another name for a fire room?

A. Yes. I would say they're also called boiler rooms.

Q. How many boiler rooms or fire rooms were located on the TURNER?

A. Two. Again, one fire room or boiler room serving the engine room behind it.

Q. And can you tell the ladies and gentlemen of the jury what kind of equipment was in the fire room?

A. The fire room contained two boilers, a boiler being a furnace, reclined furnace where oil was burned to generate heat with the hot gases going through tube banks to create high pressure steam, the boiler.

Q. Okay. And was there anything on those boilers for either efficiency of the boiler and/or protection of the people who were working around it?

Page 39

A. Of course insulated

Q. Is that similar to the insulation you have described earlier?

A. I believe so.

Q. Okay. What other equipment was in the two fire rooms?

A. Pumps to deliver the oil to the furnace and blowers to force air into the furnace.

Q. Now, you were deposed or asked questions over the course of the last two days; is that correct?

A. Yes.

Q. And those questions were pretty extensive with regard to your time on the TURNER; is that correct?

A. Yes.

Q. And at that time you also were shown what we can call Plaintiff's Exhibit P-1. And I'm just going to show that to you and ask you what that is, that document?

A. This is tiled complaint Civil Action.

Q. Okay. And did that show the defendants that were sued in your case?

A. Yes.

Page 40

Q. And were you asked to do something with regard to that document?

DEFENSE COUNSEL: Objection.

THE WITNESS: Would you clarify the question, please?

MR. REICH: Yes.

BY MR. REICH:

Q. Did we send you a copy of that document at home?

A. I believe I saw it in your office.

Q. Okay. And did we ask you to —

A. And, yes, you asked me to identify people that I might know, firms that I might know.

Q. Okay. We sent you —

DEFENSE COUNSEL: Objection to the heresay.

BY MR. REICH:

Q. Did we send this to your home?

A. Yes.

Q. Okay. And at your home did you look over it?

A. Yes.

Q. Okay. Were you asked to put your

Page 41

initials next to anything?

MS. McGARRITY: Objection, form.

MR. REICH: Okay. Strike that.

BY MR. REICH:

Q. What were you asked to do with the document?

DEFENSE COUNSEL: Objection.

THE WITNESS: I was asked to put my initials next to firms that I recognized.

BY MR. REICH:

Q. And did you do that?

A. I did.

Q. After you did that were you also shown in our office what's been marked as Plaintiff Exhibit P-2?

A. Yes.

Q. And what is Exhibit P-2 made up of?

A. P-2 is made up of the description, the listing of equipment and the — originally installed on the TURNER when she was built at Bath Iron Works, Bath, Maine. So a listing of

Page 42

equipment. Also, there is a report of a, I guess it was, an in-service inspection of the engineering spaces on the TURNER, but that was before I was aboard.

Q. And did you look through that document at that time?

A. I've looked through the document.

Q. Okay. And were you asked many questions about equipment that appears in that document and what your knowledge and experience with that equipment was while you were on the TURNER?

A. Yes.

Q. Okay. Now, at some point in your time on the USS TURNER did you receive any promotion?

A. I reported aboard as main propulsion assistant. I became the engineering officer titled in the Navy engineer officer.

Q. And when did you become the engineering

officer or engineer officer?

A. I do not recollect.

Q. Now, during the time that you were on the TURNER, were there instances where significant repair or maintenance had to be done?

A. There were, yes.

Q. Okay. And were there times where it was necessary for the TURNER to go to a shipyard or somewhere other than out on the ocean when these repairs were done? Can you tell us a little bit about that?

MR. SKINNER: Objection, form.

THE WITNESS: The TURNER had a scheduled overhaul in 19 — September, October, November through there in 1957 at the Boston Naval Shipyard.

BY MR. REICH:

Q. Okay. Do you know whether that was a scheduled service or is that something that had to be set up as a result of problems?

A. No. This was a scheduled service where the ship came to the yard with a list of items that needed repair.

Page 44

Q. Were you on the ship when it went into the Boston Navy Shipyard?

A. Yes.

Q. Were you present when those repairs or some of those repairs were done?

A. I was present when some of the repairs were done. I was present for all of what we'll call rip out of the preceding repairs.

Q. Okay. Tell us what that means.

A. Well, going to your turbine, removing the insulation and opening up the turbine for measurements and inspection if no repairs were needed.

Q. Okay. And what happened when that was done?

A. Again, when you remove insulation you get dust. You get airborne dust.

Q. Now, I think you told us that at some point during your career on the TURNER that you went to receive additional training with regard to the equipment. When did that occur?

A. The Navy sent me to the Destroyer Force Atlantic Fleet Engineering School. I left on this temporary duty in the late fall of the –

of '57, in other words, probably six weeks into the overhaul and returned to the TURNER on her training cruise based in — based out of Guantanamo Bay in the winter of '58.

Q. When — about how long then would that have been if you can estimate for me?

A. I would estimate six to eight to ten weeks.

Q. When you were still on the ship and it was being prepared for this maintenance, this scheduled maintenance and repair service, who was doing the work on the ship itself? Who was handling it? Was it the ship, your shipmates or somebody else?

A. Certain work was done by the ship's crew. The more critical work was done by the shipyard personnel.

Q. And for the time that you were on the TURNER at the Boston Navy Yard before you went to the engineering school, what were your responsibilities with regard to these maintenance and repair processes?

A. Supervisin , what was being done by both ship's personnel and by the yard personnel.

Q. And where were these repairs being conducted, what compartments on the ship?

A. The repairs were — or the engineering repairs were in the engine rooms and fire rooms.

Q. And those were the two — the four rooms that you had responsibility for on the ship?

A. Correct.

Q. After the repair in 1957 at the Boston Shipyard, was there another time while you were out on the water that it was necessary to go into a port and have some additional work done?

A. Yes.

Q. Okay. And can you tell the ladies and gentlemen of the jury what that was?

A. There are times when a ship returns to port and gets services from what's called a destroyer tender, basically a ship with machining equipment and such that you don't have on a destroyer itself.

There was a time when we were in the Sixth Fleet in the Mediterranean where we needed to get a turbine drive part

replaced. This was actually we were docked at Monte Carlo. We couldn't machine the part. We didn't have those machining capabilities. We had arranged to have the part replaced by a machinist cutting a new part on the — on a cruiser I believe it was that was moored in Villa, France.

Q. So what had to be done to the turbine that was on the TURNER in order to get it ready for the repair and replacement of the part?

A. It had to be opened up and the part removed and a new part installed.

Q. And before it could be opened up, what had to be done on the outside?

A. I had to remove the insulation.

Q. Okay. And what happened when that insulation was removed?

A. And whenever you remove insulation you get dust.

Q. Okay. And where were you in relation to it when it was being done?

A. I was standing on top of the turbine in the cloud of dust.

Q. So you breathed in the dust?

A. Yes.

Q. Did you get to see any of Monte Carlo when you were there?

A. No.

Q. Why is that?

A. My shipmates did, but I did not.

Q. Why didn't you?

A. I could not leave a ship with a turbine open.

Q. Was there — after the part, this new part was fabricated and installed, were you present when that happened by the way?

A. Yes.

Q. And what happened after the part, the new part was installed?

A. We operated in normal fashion.

Q. Was there anything aside from the metal that had to be replaced on the turbine?

A. Oh, you had to replace or repair or patch the insulation.

Q. And what happened when that was done?

A. The only way a ship's crew could do that is to replace insulation blankets if they were

Page 49

able to be replaced or patch them somehow or fill in the chunks, the missing spaces with what I referred to earlier as mud.

Q. And what happened when those materials were handled?

A. Well, the making of mud you're starting with a powder. When you handle the blanket, there's probably some dust released, too.

Q. And what happened with the powder when it was handled before it was mixed with the water?

A. It was dumped from a bag.

Q. And what happened?

A. There's dust.

Q. Okay. Was there another scheduled maintenance or repair period while you were assigned to the TURNER?

A. The TURNER was scheduled for what the Navy called FRAM, fleet rehabilitation and maintenance.

Q. I'm sorry. Say that again.

A. FRAM, fleet rehabilitation and maintenance.

Q. Okay. When was that scheduled?

Page 50

A. This was scheduled for Brooklyn Navy Yard, New York Naval Shipyard.

Q. What year was that?

A. 1960.

Q. When a ship like the TURNER goes in for — excuse me — goes in for a FRAM maintenance repair, what equipment is usually addressed?

A. FRAM was to update the electronics and the armament of a ship at the same time improve the efficiency of the engineering operations.

Q. Now, do you know when the TURNER was built?

A. 1945.

Q. So — and in 1960 when this FRAM process or procedure was instituted, what was the purpose generally with this FRAM, the FRAM thing?

A. As before, the purpose was to upgrade the armament and the, more important for our DDR, the electronics. But it was for engineering it was an opportunity to have shipyard work done in the engineering spaces.

Page 51

Q. And that was any repair or maintenance that was needed in addition to the general FRAM requirements?

A. Yes.

Q. Now, would it be fair to say that these FRAM procedures were instituted in order to keep the older ships in service and functioning up to, well, I was going to say up to speed, but up to technical requirements in the '60s?

A. Yes.

Q. And were you present on the TURNER when this process was done in 1960 in Brooklyn?

A. I was present on the TURNER during the planning and again during what I'll call rip out.

Q. Who in fact was involved in the planning of what work in addition to the updating of the electronics and armament would be done at the Brooklyn Shipyard?

A. As engineering officer I prepared work orders, prioritized work orders and then went with the captain, we were home ported at the time in Mayport, Florida, came to New York

several times to negotiate the work with the New York Naval Shipyard.

Q. Okay. And, again, with regard to the rip out, you said that you were present. Approximately how long were you present during the rip out of materials in 1960 in Brooklyn?

A. I don't remember when we arrived in Brooklyn. I left the TURNER when I left the Navy in June of 1960. I was present for most all of the rip out.

Q. In the process of this rip out of the equipment and materials what happened? What, if anything, did it do to the air?

A. Well, again, if you disturb insulation you get dust from the disturbed insulation.

Q. And was that done?

A. Yes.

Q. And how close were you when you were there on the TURNER?

A. As any other maintenance procedure I was right close to the procedure and that when — that's not a very precise answer. A couple feet.

Q. Thank you.

Page 53

A. One or two, three.

Q. When — and where are the engine rooms and fire rooms located on the TURNER? Are they above deck, below deck? What level are they on? Tell us a little bit about that.

A. They vertically extend from the bilges of the ship, the bottom of the ship to the main deck.

Q. Did there come a time when you were discharged from the Navy?

A. Yes.

Q. And when was that, sir?

A. That was in June of 1960.

Q. Was that an honorable discharge?

A. Yes.

Q. Where did you go to work after you left the Navy?

A. The Rohm & Haas Company in Philadelphia.

Q. What was your job at Rohm & Haas? What were you hired to do?

A. I was hired to do technical marketing for Rohm & Hass's Plexiglas brand methyl methacrylate sheet.

Q. And tell us a little bit more. When you

Page 54

say marketing for that product, what were you doing as technical marketer or marketing?

A. Searching for new markets for this material which was originally used in World War II aircraft. In peacetime uses had evolved to the internally illuminated sign, but with the passage greater than the sign industry, we looked for building type applications. The dome skylight would be one that I worked with.

Q. How many years did you work at Rohm & Haas?

A. I've lost track of how many years. I, of course, progressed into other products, other roles, but all of my work at Rohm & Haas was in what we'll call technical marketing or commercial development.

Q. And do you recall when you left Rohm & Haas?

A. Not without the benefit of notes.

Q. Okay. Was it approximately 1992?

A. Yes.

Q. And when you left Rohm & Haas, were you also involved in any other kind of business or

Page 55

work?

A. I had — I consulted in the chemical industry, plastics industry and had several businesses involved in insulation of metal buildings utilizing fiberglass.

Q. And was this with the approval of Rohm & Haas? They knew about it and they accepted that?

A. Well, in fact, before I left Rohm & Haas, I had an employment contract modified to allow me to consult in any area I wished except something that would conflict with my primary Rohm & Haas job.

Q. Was one of the responsibilities that you had or one of the consulting jobs related to a product that at one point was Rohm & Haas's product or a division that they either sold off or divested themselves of?

A. I divested or two of us divested a business. And the buyer of the business needed a lot of help on the business side, not necessarily the plastic compounding side, and that was, of course, why Rohm & Haas allowed me to negotiate such an employment contract

Page 56

rather unique in industry.

Q. In fact, you were helping Rohm & Haas make this sale a successful one by assisting the purchaser in being able to make this a successful business; is that right?

A. Yes.

Q. Now, when you left, to the best of your knowledge, was there any exposure to asbestos at Rohm & Haas?

A. I was located in marketing offices, headquarters offices.

Q. So to the best of your knowledge —

A. To the best of my knowledge —

Q. —there was no exposure to asbestos?

A. No real exposure to asbestos.

Q. Was there any exposure that you know of? There was none that you know of at Rohm & Haas?

A. I did get into Rohm & Haas plants for a variety of meetings and such, so I did get into the Bristol plant for example.

Q. Okay. But just for meetings?

A. Most all were for meetings.

Q. Okay. And you were in meeting rooms at

those plants?

A. Yes.

Q. With regard to after you left Rohm & Haas, what if anything else were you doing?

A. Well, I mentioned earlier that I expanded the consulting and ended up with three companies involved in the insulating, insulating metal buildings.

Q. And was there any asbestos exposure involved in any of that?

A. Absolutely no asbestos involved in that, that insulating process.

Q. Are you involved today in anything that's close to your heart that you do?

A. I still do a limited amount of consulting. Really it's more as a manufacturer's rep in one — for one client in the flame retardant industry. Over the years I've become quite knowledgeable in flame retardant chemistry. This client has a system that is an effective flame retardant, unlike others is environmentally friendly, unfortunately not easy to use.

So my challenge in life right

Page 58

now is to try and save some lives without screwing up the environment.

Q. The other — were you involved in any of the actual hands-on chemical mixing and making of these products yourself?

A. Which products before I answer?

Q. Okay. I mean, with regard to the fire retardants and —

A. I never was involved in hands-on bench work or other — with flame retardants of any sort.

Q. Okay. And why is it important to you to continue the work with regard to this particular kind of flame retardant?

A. Well, as I said, flame retardants have a — have many bad environmental consequences. And this particular one is environmentally friendly. It can replace those with bad environmental consequences on certain occasions.

Q. Okay. Over the years have you developed any hobbies or interests?

A. I have been a fisherman most of my life. When my body slowed down, my with and I both

Page 59

had to stop playing tennis. So I've tried to learn how to play golf.

Q. And what are some of the activities you would do with your wife?

A. Well, we would sometimes play tennis or golf together, but more we also traveled fairly extensively.

Q. Have you ever smoked cigarettes or —

A. I never smoked a cigarette.

Q. Okay. And were you ever a smoker of any other kind of tobacco product?

A. I think I tried a pipe once — about one hour in college days. And it was just too much work.

Q. What was your general health before 2012?

A. I've been blessed with good health, no health issues at all, no life threatening health issues at all, no life-threatening health issues at all before 2012.

Q. And what happened in 2012 that may have changed that?

A. I was diagnosed with lung cancer.

Q. Can you tell the ladies and gentlemen of the jury, please, the process that led to that

diagnosis? What were you experiencing that led you to get medical treatment or care?

A. In the winter of like February, March 2012, I was expecting shortness of breath, headaches, primary care physician couldn't see any reasonable causes, referred me to several specialists. One was a pulmonologist. This was for two reasons. One because I was short of breath, but also because the primary care physician and my wife have said that I've had sleep apnea for years. And the pulmonologist was — did sleep studies as well as checking breathing.

Q. Was that Doctor Friedenheim?

A. Doctor Richard Friedenheim.

Q. And where was that? What hospital is he affiliated with?

A. He's affiliated with Abington Memorial Hospital.

Q. And what did Doctor Friedenheim do to determine the cause of your shortness of breath?

A. Well, he identified fluid, removed the fluid.

Page 61

Q. How did he go about removing that fluid?

A. Whatever they call it, a needle between the ribs and drained fluid by gravity.

Q. And how did that feel when that was done?

A. My lung — of course, you're removing a fair volume of material from the lung. The lung will normally reinflate quite easily. My lungs didn't want to reinflate very easily. It was rather painful for a period, a short period of time.

Q. Do you remember approximately how much fluid was removed from your lung at that time or from around your lung?

A. Well, it was over 600 cc's. The number I heard was 600 cc's. but Doctor Friedenheim had a somewhat higher number.

Q. Is that — in relation to something that we would understand, how does that relate, say to a quart? Was it a little bit less than a quart?

A. Yeah. Probably about a quart, a little less than a quart.

Q. Okay. Now, were any tests done on this

* * *

Page 82

deposition will continue.

MR. REICH: Well, to the extent that any materials, medical records — certainly we don't have medical records. We're doing this deposition quickly because we don't know how Mr. DeVries is going to react to the chemotherapy and the treatments that he has. And we're attempting to preserve his testimony.

Certainly the medical records will be made available to the extent as quickly and as fully as we can all get them from the hospitals. Mr. DeVries has signed various HIPAA authorizations. My understanding is that they're out there. And as sooon as those records are available they'll be available to us.

MR. KATTNER: All right. And subject to the production of those records this deposition will remain open, will not be closed and can be continued subject only to scheduling upon receipt of those records.

MR. REICH: I don't agree to anything with regard to that. You can make

Page 83

your motions to do whatever you feel you need to do.

MR. KATTNER: Of course, there's no need for a separate motion, but we're just stating this for the record so it's clear.

MR. REICH: Like I said, I don't necessarily agree with that.

Okay. We can go back on the video. I feel this has been full and thorough and anything else is really not necessary.

MR. KATTNER: But you have not yourself obtained or produced the radon records or the military records he says that he has in his possession.

MR. REICH: No. He's not an expert, so he's not going to be the one testifying about that stuff anyway. You asked him about it. It's on the record. Whatever is obtained will be made available obviously.

I'm sure you're going to show it to people. We're going to show it to people. We're going to show it to people. Trying to question him more about them I don't think is going to be productive

for anybody. But I understand what you are saying. Let's go back on the video, please.

THE VIDEOTAPE OPERATOR: The time is 11:51. We're back on the video record.

BY MR. KATTNER:

Q. Mr. DeVries, I understand you lived a number of years at 1260 Gravel Hill Road, Southampton, PA; is that correct?

A. Yes.

Q. And the zip code there was 18966?

A. Yes.

Q. And I think you were there somewhere around 20 years at least from the time of your retirement or moving out of Rohm & Haas through a sale of that property somewhere around 2011; correct?

A. Sold the property in 2011 and was there at least 20 years by your count.

Q. And you had some radon tests performed yourself in connection with the sale; correct?

A. In preparation for the sale of the property we had radon test performed and had a home inspection performed.

Page 85

Q. And the seller also had a home inspection performed that involved, among other things, radon; correct?

A. Yes.

Q. And I understand that your testimony was that the selling price was reduced as a result of those radon tests disputes by some amount?

A. I understood that from the realtor.

Q. And I take it you — all right. Now, sir, when you were on the U.S. Navy ship the USS TURNER you were a Naval officer at all times; correct?

A. Yes.

Q. And it's your understanding as reflected in the 1945 documents is that the exhibit I think one or two is, among other things, that that ship had been built in strict accordance with Navy specifications; is that correct?

A. Will you restate that question, please?

Q. Sure. If I could have the copy of the exhibit? I apologize. Your understanding as a Naval officer that, among other things, as reflected in this DeVries Exhibit 2 is that it was reported the machinery of the subject.

Page 86

vessel including engines, boilers, appurtenances, spare parts is strong and well built and in strict accordance with the drawings, specifications and duly

authorized changes therein except for those listed on the work list cards furnished by the Board as per this document which is titled From Office of Supervisor of Shipbuilding U.S. Navy, Bath, Maine, June 1945?

MR. REICH: Okay. I'll object. Can we go off the record, please?

THE VIDEOTAPE OPERATOR: The time is 11:54. We're going off the video record.

MR. REICH: Number one I object because he has no personal knowledge of that. Number two I object because even in what you read it said that except for various cards that we don't have that he hasn't seen, so I guess it wasn't completely built in accord with the specs if there are cards that indicate otherwise.

But I don't think he's the right witness to answer that question. He

doesn't have that knowledge. And I object to it for that reason.

MR. KATTNER: Okay.

THE VIDEOTAPE OPERATOR: The time is 11:55. We are back on the video record.

BY MR. KATTNER:

Q. And, Mr. DeVries, I think you testified that you were a midshipman in the Navy ROTC some time between 1952 and 1957 at Cornell; correct?

A. Yes.

Q. And you were trained through that Navy ROTC program in, among other things, Naval science; is that correct?

A. Yes.

Q. And your testimony was that you do not recall seeing the Navy Bluejacket's Manual?

A. Do not recall seeing a Navy Bluejacket's Manual.

Q. And whether you were instructed in accordance with it one way or another it's not something that you recall as of this time; is that correct?

Page 88

A. It's unlikely I would have seen a Bluejacket's Manual because that was given to I understand enlisted people.

Q. I see. Were you ever told that as a potential officer or division officer it would be your duty to instruct the men in appropriate safety precautions?

A. As a generality, yes.

Q. And were you ever instructed that the Navy had a safety precaution's department?

A. No.

Q. You were however instructed according to the Navy way, correct, the right way, the wrong way or the Navy way?

A. Yes.

Q. Okay. And, sir, at all times you were on the USS TURNER as you have mentioned you were a Naval officer; correct?

A. Yes.

Q. And after your first few months there, as you have testified, you went away to what you called the destroyer school to get further training from the Navy; correct?

A. Yes.

Page 89

Q. What was the name of that school again?

A. As I best remember, Destroyer Force Atlantic Fleet Engineering Officer's School or something of that sort.

Q. Okay. And to the extent you received more specific instruction about the equipment on the ship, did you have an opportunity to review the Navy specifications for turbines or other machinery on the ship?

A. I don't recollect any review.

Q. Were you aware that Navy regulations, at least from 1953 or other times, stated that the insulation of lagging on the machinery equipment would be furnished by the shipbuilder?

MR. REICH: Objection.

BY MR. KATTNER:

Q. Were you aware of that from your training?

A. I was neither aware of it nor was I dealing ever with the shipbuilder.

Q. Okay.

MR. REICH: Move to strike.

BY MR. KATTNER:

Page 90

Q. Sir, during your time on the ship, you agree that there were lots and lots of pipes throughout the ship; correct?

A. There were pipes.

Q. And there were many insulated parts of the ship; correct?

MS. McGARRITY: Objection, form.

THE WITNESS: What kind of parts?

MR. KATTNER: Machinery, pipes.

THE WITNESS: Pipes and the machinery that we've discussed in the engineering spaces were insulated when the fluid inside was hot.

BY MR. KATTNER:

Q. And your responsibilities, as you have described earlier in your deposition, were throughout the engineering spaces of the ship; correct?

A. Yes.

Q. And your — you were in the aft of officers' berthing area in the ship?

A. Yes.

Q. Did you also take meals with the other officers in the wardroom?

A. Forward wardroom, yes.

Q. And among the parts of the Engineering Department that were your responsibility included the engineering office? Did you serve time there?

A. I guess they would call it engineering office, but it was basically my stateroom.

Q. Okay. And then there was the forward and the aft fire rooms; correct?

A. Yes.

Q. And there was also the forward and the aft engine room?

A. Yes.

Q. And these — the fire rooms had an upper level and a lower level; correct?

A. I don't recollect how they were configured.

Q. I see. But they had various levels that are —

A. They were — yes.

Q. Okay. So sailors could be walking at

one level or a different level depending on what their function was?

A. Yes.

Q. And as the officer you visited each of those levels at different times?

A. I was in those fire rooms and engine rooms almost continuously.

Q. And in addition to a specific piece of machinery, there was quite a bit of insulated piping in each of those fire rooms and engine rooms; correct?

MS. McGARRITY: Objection, form.

THE WITNESS: There was insulated piping, yes.

BY MR. KATTNER:

Q. And I think you — we examined that you personally did not know the manufacturing of the insulation on the material on the ship, did you?

A. Please restate it.

Q. Okay.

A. I think there was a double negative there.

Page 93

Q. I will restate the question. Thank you, sir. As far as who supplied the insulation that was present on the ship when you first joined it, who manufactured the insulation on the outside of the machinery, you personally don't know who had manufactured that?

A. I do not know the manufacturer.

Q. Nor did you — you know from records that there had been some prior overhauls and inspections on various pieces of machinery on the ship; correct?

A. Yes.

Q. And with respect to whatever was ripped out and replaced as the insulation on those prior visits you personally don't know what they were?

A. Yes.

Q. And during the time you were at the ship, for instance, you mentioned the Boston rip out of insulation, you went to engineering school or the destroyer school. When you came back the insulation had already been replaced; correct?

A. Yes. Yes.

Page 94

Q. But you don't know from what manufacturer had supplied the replacement insulation?

A. I do not know the manufacturer of the insulation.

Q. All right, sir. And at this time I understand your treatment is still ongoing?

A. It will be ongoing the rest of my life.

MR. KATTNER: Okay. And subject to the earlier comments, I'm going to pass you either to another counsel or thank you for your time today.

THE VIDEOTAPE OPERATOR: The time is 12:02. We're going off the video record.

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(Whereupon, a discussion was held off the record.)

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THE VIDEOTAPE OPERATOR: The time is 12:03. We're back on the video record.

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EXAMINATION

Page 95

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BY MR. WEINBERG:

Q. Good morning, sir. David Weinberg. We met the other day. I just have a few follow-up questions for you. Now, you told us you joined the Navy in June of 1957. That's when you were assigned to the USS TURNER; right?

A. More properly I joined the Navy when I became a midshipman.

Q. Okay. But you actually became active duty in June of 1957 and went to the USS TURNER; right?

A. When I reported aboard the TURNER, yes, sir.

Q. And about three or four months after you reported that ship was sent to the Boston Navy Yard for an overhaul; right?

A. It was sent to the Navy Yard in the late fall, winter.

Q. Okay. And after about three or four weeks of — in that overhaul you were sent to engineering school; correct?

A. I think it was more than three or

Page 96

four weeks, but, yes, I went to engineering school.

Q. And during the time that you were there at the Boston Naval Yard during that overhaul on the USS TURNER they were removing the insulation from the ship; is that right?

A. Yes.

MR. REICH: I'm going to object only because we don't know how much. The question is unclear, seems to indicate all of it was removed or some of it. I don't know.

BY MR. WEINBERG:

Q. Okay. As far as the engineering spaces that you were in charge of the insulation and lagging was removed out of those spaces; isn't that correct?

A. I do not recollect the — what I recollect is removal of insulation from individual, specific units.

Q. Okay. And when we talk about insulation we're talking about the pipe covering or those half moons that go on the pipe; isn't that correct? That's one of the parts of

Page 97

insulation?

MS. McGARRITY: Objection, form.

THE WITNESS: But I have not discussed the pipe cover.

BY MR. WEINBERG:

Q. What is that, sir?

A. I've not discussed pipe covering.

Q. Okay. But that's what we're talking about when we're talking about insulation. The pipe covering that goes around the pipes that's one aspect in insulation; isn't that right?

MS. McGARRITY: Objection, form.

BY MR. WEINBERG:

Q. You can answer, sir.

A. That's one use of insulation.

Q. Right. And another one is the cement product, like a mud that goes — that's applied or troweled onto different equipment or around elbows around piping; isn't that right?

A. Yes.

Q. All right. And you also have blankets that were used as insulation products; right?

A. On certain pieces of equipment, yes.

Q. Okay. And those were the products that were being removed during that overhaul in Boston in 1957; right?

MS. McGARRITY: Objection, form.

MR. REICH: Objection. It's a compound question. Which one was being removed?

MR. WEINBERG: All of them. That's if he can answer that and then I'll break it up if you can't.

BY MR. WEINBERG:

Q. Were all those type of products being — the type of products being removed during that overhaul in Boston in 1957?

MS. MCGARRITY: Objection, form.

THE WITNESS: I don't recollect which units were worked on at Boston.

BY MR. WEINBERG:

Page 99

Q. Okay. You also talked about an overhaul in Brooklyn in 1960. Was that the type of work that was being done in Brooklyn as well where they were removing insulation and lagging from equipment and piping during that time period on the USS TURNER?

MS. McGARRITY: Objection, form.

THE WITNESS: Similar removal.

BY MR. WEINBERG:

Q. And when they were removing the insulation and lagging from the products, from the equipment in Brooklyn in 1960, did that create dust?

MS. MCGARRITY: Objection, form.

THE WITNESS: Whenever you disturbed insulation on equipment you create dust.

BY MR. WEINBERG:

Q. Okay. And did you breathe that dust, sir?

MS. McGARRITY: Objection, calls for speculation.

Page 100

THE WITNESS: Yes.

BY MR. WEINBERG:

Q. And the same with the Boston Navy Yard in 1957, when they did that overhaul, did that create dust when they were removing that insulation before you left for engineering school?

MS. McGARRITY: Objection, form.

THE WITNESS: As before, whenever you remove insulation, disrupt insulation, at least in the types of insulation used in those days, you created dust.

BY MR. WEINBERG:

Q. And did you breathe that dust that was created?

MS. McGARRITY: Objection, calls for speculation.

THE WITNESS: Yes.

BY MR. WEINBERG:

Q. All right, sir. Now, one of the things I want to ask you about is when you were talking about the work, when Mr. Reich, your

attorney was asking you questions that was being done on some of the equipment, it was your job to supervise that work; correct?

A. It was my job to make sure it was done right.

Q. Okay. And my term was supervising and your term is to be done right. Is it the same thing?

A. I think sometimes we go a little farther with our own hands than just standing and looking.

Q. Okay. But you're observing others doing this work on the equipment; correct?

A. Others were assigned to do the work.

Q. Right. All right. Now, I want to switch gears with your, sir. And I know you have told us you have gone to two different oncologists. Have either of those oncologists ever told you that your lung cancer is related to asbestos exposure?

A. I have been so told.

Q. And who has told you that?

A. Neither of the oncologists.

Q. Okay. Well, my question was, did either

* * *

personal mechanical work on any of the equipment aboard the ship as an engineer officer?

A. I worked with our people.

Q. But was your work limited to supervision?

A. It was supposed to be.

Q. Were there occasions when you actually had to perform work yourself on the equipment?

A. I had to show people how to.

Q. Now, the USS TURNER, it's my understanding that that ship was built in 1945. Are you aware of that?

A. At the Bath Iron Works.

Q. And at the time of construction that would be the point in time when all the pipe lines would be installed on the ship; is that correct?

A. I believe so.

Q. At the time of construction that would be the time when the equipment was installed aboard the ship; is that correct?

A. I believe so.

Q. Would you have any knowledge of any of

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IN THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA

DONNA L. HAGEN, Individually and as Executrix of the Estate of MALCOLM HAGEN	:	
Plaintiff,	:	**CIVIL ACTION NO.**
VS.	:	**2:07-cv-63346**
FOSTER WHEELER ENERGY CORPORATION and GENERAL ELECTRIC COMPANY, et al.	:	
Defendants.	:	

AFFIDAVIT OF THOMAS F. MCCAFFERY IN SUPPORT OF FOSTER WHEELER ENERGY CORPORATION AND GENERAL ELECTRIC COMPANY'S LEAVE TO FILE SUPPLEMENTAL BRIEFING AFTER ORAL ARGUMENTS

I, Thomas F. McCaffery, being duly sworn, deposes and says:

1. I am currently a Commander in the United States Naval Reserves, and have been an officer since 1976. I have served active duty on a variety of cruiser and destroyer type ships assigned to the U.S. Atlantic and Pacific Fleets. My performance was recognized

by four personal awards and being recalled, by name, twice during the Persian Gulf War of 1990/91. I also served aboard U.S. Merchant Marine vessels. I graduated from the U.S. Merchant Marine Academy in 1976 with a B.S. in Marine Transportation and Management, and also graduated from the U.S. Naval War College, College of Command and Staff in 1991. I am also a technical consultant, naval researcher, naval historian and head of a company that specializes in U.S. Navy and merchant marine ship design, development, construction, maintenance and repair records, as well as Navy/Military specification, qualified products lists and related records.

2. Based on my experience, training, education, and research, I am personally familiar with the U.S. Navy's approach to Safety and Industrial Hygiene from the 1930s to present. Throughout this period, the U.S. Navy always viewed Safety Precautions (accident prevention to avoid personal injury or loss of life) separately from Industrial Hygiene (prevention of long and short-term industrial diseases). In fact, to this day, the U.S. Navy continues to have separate commands that are charged with Navy-wide responsibility for Safety Precautions (Naval Safety Center) and Industrial Hygiene (Navy & Marine Corps Public Health Center). Those commands are so separate that they don't even report to same command; the Naval Safety Center reports directly to the Chief of Naval Operations, whereas the Navy & Marine Corps Public Health Center reports to the Surgeon General of the Navy (Bureau of Medicine and Surgery). To that end, the U.S. Navy considers Safety Precautions to be a line management function, which involves accident prevention to avoid personal injury or loss of life,

whereas Industrial Hygiene is a medical function, which involves prevention of long and short-term industrial diseases caused by exposure to toxic or hazardous materials. The U.S. Navy did not consider, based on its own research and investigations (e.g., "A Health Survey of Pipe Covering Operations in Constructing Naval Vessels," 1946, by W.E. Fleischer, F.J. Viles, Jr., R.L. Gade and P. Drinker) asbestos-containing materials, as used on Navy ships, to be sufficiently hazardous or toxic, to require warning labels until after 1970 (e.g., U.S. Navy Bureau of Medicine and Surgery Instruction 6260.14, "Asbestos; Measures for Control of").

3. Machinery for U.S. Navy ships, such as that manufactured by Foster Wheeler and General Electric, was purchased by the U.S. Navy either directly or through a shipbuilder which had been awarded a prime contract to build one or more ships for the U.S. Navy. Procurement of machinery by shipyards, such as New York Shipbuilding Corporation, for the construction, conversion or repair of U.S. Navy ships was subject to U.S. Navy requirements for contracts just as if the contract were between the manufacturer and the U.S. Navy and not the shipyard. The Navy's contract terms covered every aspect of the machinery procurement process from initial design and plans through manufacturing, inspection, and the machinery's shipment to the shipyard. One of the specific contractual requirements was for manufacturers to write an approved technical manual for the machinery. To that end, the Navy, starting in 1945, issued precise specifications for the content and format of instruction books or technical manuals.

4. The design for the USS Kitty Hawk began years before its keel was laid on December 27, 1956. Thus, the Military Specification for Technical Manuals for Mechanical and Electric Equipment that governed Foster Wheeler and General Electric's original equipment supplied to that vessel was the August 16, 1954 MIL-T-15071B unless the purchase order or contract for the machinery was amended after September 10, 1957 to require compliance with MIL-T-15071C. I am also informed that plaintiff Malcolm Hagen alleged to have worked on or around the USS Kitty Hawk from sometime in 1958 to sometime in 1961. Accordingly, I will also discuss the Military Specifications for Technical Manuals for Mechanical and Electrical Equipment that were in effect during the 1958 to 1961 period for completeness and context only.

5. In the manuals which the manufacturers were obligated to provide under their contract or purchase order, the U.S. Navy required equipment manufacturers to provide operating and maintenance instructions specific to their products which the U.S. Navy purchased. The Military Specification for Technical Manuals for Mechanical and Electric Equipment in effect from August 16, 1954 to September 10, 1957 (MIL-T-15071B) provides that an equipment manufacture's technical manual shall contain a safety notice "where high voltages or special hazards are involved." *See*, 3.5.1.1. That section directs us to "see figure 9." Figure 9 is the last page of that technical manual, which provides those circumstances representing high voltages or special hazards, all of which relate to accident prevention to avoid immediate and certain personal injury or loss of life and/or damage or destruction of

the equipment. Nothing contained within figure 9 remotely pertains to the prevention of long and short-term industrial diseases caused by exposure to toxic or hazardous materials.

6. The next two editions of the Military Specification for Technical Manuals for Mechanical and Electric Equipment (MIL M-15071C in effect from September 10, 1957 to June 6, 1961 and MIL-M-15071D effective June 6, 1961) remove the provision requiring a safety notice where high voltages or special hazards are involved. In its place, the U.S. Navy distinguishes between those activities that "will" damage or destroy the equipment versus those activities that "will" result in immediate and certain personal injury or death:

> **3.3.3.2 Emphasis.** - ***When necessary***, emphatics such as "NOTE", "CAUTION", and "WARNING" shall be used as adjuncts to the text. These, however, ***shall be used as sparingly as is consistent with the real need.*** The appropriate adjunct to the text shall be selected in accordance with the following definition:
>
> (a) "NOTE" - An operating procedure, condition, etc., which it is essential to highlight.
>
> (b) "CAUTION" - Operating procedures, practices, etc., when if not strictly observed, ***will result*** in damage or destruction of equipment.
>
> (c) "WARNING" - Operating procedures, practices, etc., which <u>will result in personal injury or loss of life</u> if not correctly followed.

See, MIL-T-15071C - September 10, 1957 (*emphasis* added).

3.3.6 *Notes, cautions and warnings.* - Notes, cautions and warnings should be used to emphasize important and critical instructions. *The use should be as sparing as is consistent with real need.* When used, notes, cautions and warnings should immediately precede the applicable instructions and shall be selected in accordance with the following definitions:

(a) "NOTE" - An operating procedure, condition, etc., which it is essential to highlight.

(b) "CAUTION" - Operating procedures, practices, etc., when if not strictly observed, *will result* in damage or destruction of equipment.

(c) "WARNING" - Operating procedures, practices, etc., which *will result in personal injury or loss of life* if not correctly followed.

See, MIL-T-15071D - June 6, 1961 (*emphasis* added).

7. Under the 1957 and 1961 versions MIL-T-15071, the text of any warning "shall be factual." *See*, MIL-T-15071C, Section 3.3.3.1 - September 10, 1957; *see also*, MIL-T-15071D, Section 3.3.1 - June 6, 1961. Accordingly, any "Warning" had to meet a three-part test. First, it had to be "factual" in that it was always a true statement. Second, the Navy must have agreed that a "real need" for the warning existed. Third, the warning must address operating procedures or practices that "will result" in immediate and certain personal injury or death every time that procedure or practice is "not correctly followed." Given the fact that not everyone who is exposed to asbestos suffers an as-

bestos-related disease, a warning pertaining to a minute and speculative long-term disease that may or may not occur 15 to 40 years in the future was not permitted under this three-part test.

8. In analyzing the U.S. Navy's hazard communication program as exemplified in the 1954, 1957 and 1961 versions of MIL-T-15071, it is clear that the U.S. Navy required reasonably precise specifications pertaining to cautions and warnings in that any caution or warning supplied by an equipment manufacturer had to describe an operating practice or procedure that "will result" in **immediate** and **certain** personal injury, loss of life, damage to equipment or destruction of equipment. It was not until after 1970 that the U.S. Navy considered asbestos-containing materials to be sufficiently hazardous or toxic, as used on Navy ships, to require warning labels.

By: s/Thomas F. McCaffery
Thomas F. McCaffery

Sworn and subscribed to before me
this 17th day of December, 2009
s/Ralph Hammock
Ralph Hammock
Notary Public
Commonwealth of Virginia
My Commission Expires April 30, 2010
Commission ID# 266451

JOHN B. DeVRIES	:	COURT OF COMMON
and	:	PLEAS
ROBERTA G.	:	PHILADELPHIA COUNTY
DeVRIES,	:	
h/w	:	
Plaintiffs	:	DECEMBER TERM, 2012
	:	
vs.	:	
	:	NO. 3661
ALLEN-BRADLEY	:	
COMPANY, et al.		ASBESTOS CASE
Defendants		

— — —

TUESDAY, JANUARY 15, 2013

— — —

Videotaped Discovery

Deposition of JOHN B. DeVRIES, taken pursuant to notice, held at the offices of Veritext National Court Reporting Company, 1801 Market Street, Suite 1800, Philadelphia, Pennsylvania on the above date, beginning at or about 10:10 a.m., before Kathleen Woods Logue, Professional Reporter and Notary Public there being present.

— — —

VERITEXT NATIONAL COURT REPORTING COMPANY
MID-ATLANTIC REGION
1801 Market Street — Suite 1800
Philadelphia, Pennsylvania 19103

Page 258

to any Bell & Gossett equipment?

A. Yes.

Q. Okay. Now, I want to focus your attention on the Foster Wheeler condensers on board the TURNER. Can you tell me where these condensers were located?

A. In the engine room.

Q. And I believe there were two of them?

A. Yes.

Q. Okay. You don't recall any other Foster Wheeler equipment on board the TURNER; correct?

A. Correct.

Q. Okay. Now, there were two engine rooms. Does that mean there was one condenser in each room?

A. There actually were two condensers in each engine room. One was sort of an auxiliary, so —

Q. So there were —

A. One Foster Wheeler condenser in each engine room.

Q. Okay. And then there was one auxiliary condenser to go with that?

Page 259

A. Yes.

Q. And those auxiliary condensers were not manufactured by Foster Wheeler; correct?

A. I refer to the data you've been given.

Q. Well, you know, we can look at that. I believe I can direct your attention to — well, I guess it's not numbered, the page, but under part Roman Numeral IV in Plaintiff's Exhibit 2.

MR. REICH: Let's go off the video record —

MR. MASTROIANNI: Sure.

MR. REICH: — while we find that.

THE VIDEOTAPE OPERATOR: The time is 4:12. We're going off the video record.

MR. MASTROIANNI: It's towards the end. It's Roman Number IV. There's a heading on top, Machinery Installation. Do you see it?

MR. REICH: No. I must be missing it. Mine goes from three to six.

THE WITNESS: I think it's six

Page 260

he means.

MR. MASTROIANNI: Roman Number IV.

THE WITNESS: I have Roman Numeral VI here that's relevant.

MR. MASTROIANNI: Oh, sorry. Roman Number VI. I'm dyslexic. So I switched the V and the I.

MR. WEINBERG: It says machinery installation?

MR. MASTROIANNI: Yes.

THE VIDEOTAPE OPERATOR: The time is 4:13. We're back on the video record.

BY MR. MASTROIANNI:

Q. Okay, sir. So you'll notice paragraph F?

A. Yes.

Q. If you read along with me it just says, Main condensers consists of two single pass condensers manufactured by Foster Wheeler Corporation.

So as you stated before to the extent that your recollection is consistent with these records you can only recall two

Page 261

Foster Wheeler condensers on board the TURNER; correct?

A. I recall two Foster Wheeler condensers and two Worthington condensers.

Q. Worthington. And those were the auxiliary condensers?

A. And those were the auxiliaries as listed here.

Q. Are you able to tell me the purpose of the Foster Wheeler condensers?

A. Well, your main condenser took the spent steam from the turbine and cooled it to water and then recycled through pumps to the boiler.

Q. Can you describe the size of one of these main condensers for me and the shape?

A. It looked like a big sea cow, a manatee. The headers of the condenser were big enough for two or three men to get into, to give you a — an assessment of size.

Q. And they were shaped like a manatee, so —

A. I just — a big, bulky —

Q. Were they cylindrical in shape like —

A. Horizontal.

* * *

Page 266

this afternoon you talked at great length with Mr. Stokes about the nature of the repair and maintenance work that you would oversee. You didn't discuss anything pertaining to these condensers per se.

Do you recall any kind of maintenance or repair work being done by any of the seamen that you oversaw with respect to the Foster Wheeler condenser?

MR. REICH: This is any time that he's on the ship?

MR. MASTROIANNI: Correct. Now we're talking about any time.

THE WITNESS: I recall vividly salt water contamination of the condensate in the condenser. This came from leaks in condenser tubes.

BY MR. MASTROIANNI:

Q. Do you recall what year that was, a time period maybe?

A. This was at sea. I am uncertain. Probably 1959. You can cross-reference my date with the landing of the first Mercury capsule because we were the recovery ship.

Page 267

And the capsule was 500 miles off range.

Q. Are we talking about the moon?

A. It was the first attempt to shoot a rocket up.

Q. Oh, okay.

A. This was just a piece of sheet metal.

Q. Oh, landing coming down. Okay. Sorry.

A. Mercury is too far back for your memory.

Q. Yeah. I'd say that's a fair statement. Now, with respect to this salt water contamination, this I think you said was a result of a leak in the tubes inside the condenser?

A. Tube leaks, yes.

Q. And this allowed for salt water to get inside.

A. Yes.

Q. All right. This happened I'm assuming with only — with respect to only one of the condensers; correct?

A. Yes.

Q. Okay. And are you able to tell me the nature of the repair work that you had to do with respect to this one condenser in order to

* * *

Page 270

of importance. Is that a fair statement?

A. Yes. It was actually the captain and myself.

Q. Now, backing up the damage control that you guys would essentially do to the tubes that were leaking on this condenser, are you able to estimate for me approximately how long it took for you to identify the one leaking tube and then plug that tube start to finish?

A. No. Recognize also it wasn't just one leaking tube, there were several, probably several dozen.

Q Did it take more than a day or a week?

A. It took several days.

Q. Okay. Now all the while you are doing this work, are you giving orders or are you essentially receiving orders and then distributing — redistributing those orders, receiving from a superior officer I should say?

A. First there's no superior over me as engineer officer and relating to the engineering spaces. I advised, showed, helped

the people doing the search for leaks. And at one stage I spent about six hours in that header myself.

Q. And is that the time you mentioned earlier when you said you yourself went inside one of these headers?

A: Yeah.

Q. Okay. So you went inside a header just on one occasion to look for leaks?

A. I was in it several times, but I—

Q. How did you know what needed to be done to the condenser?

A. A high pressure marine boiler can't have contaminants in the water. We had an instrument that measured the salinity and we saw the salinity creeping up. We knew we reached a point where we'd have to shut that engine down.

Q. And you had background knowledge of this type of potential problem from your studies at Cornell or —

A. No. From the Destroyer Force Engineering School.

Q. Okay. So that brief period after –

Page 272

when the ship was dry docked and you went to that school?

A. No. This is the second — we're talking now the second shipyard overhaul.

Q. Right.

A. Not the first one.

Q. And it was during that time period where you were in engineering school that you acquired that knowledge how to look for problems, identify a problem and determine what needed to be done?

A. We were taught how to run those plants.

Q. Okay,

MR. REICH: How many weeks was that course, approximate?

THE WITNESS: I recollect it was like eight or ten weeks. It could have been plus or minus two.

BY MR. MASTROIANNI:

Q. Did you ever — well, strike that. Were there any manuals that accompanied these condensers?

A. Yes.

Q. Okay. And did you yourself have

Page 273

occasion to review those manuals?

A. On occasion.

Q. Okay. Did you review those manuals with respect to the contaminated salt water problem?

A. Of course,

Q. Okay. And that provided you with some kind of direction in terms of what needed to be done to prevent any further damage?

A. Yes. But — yes.

Q. Okay. Were those manuals procured or supplied by the Navy or were they directly from Foster Wheeler?

A. They were from Foster Wheeler through the Navy. Presumably, the supply contract involved not just spare parts but also manuals.

Q. So the manuals you knew they were from Foster Wheeler how?

A. Foster Wheeler's-name on them.

Q. Okay. Was it then just a name or was it like a logo, something more distinct?

A. Name, logo, whatever would have been put on by Foster Wheeler.

* * *

Page276

MR. MASTROIANNI: Thank you.

BY MR. MASTROIANNI:

Q. Mr. DeVries, as you sit here today, do you know whether you were exposed to any asbestos in relation to the work that you and your crew that you oversaw performed with respect to the contaminated salt water issue on the one Foster Wheeler condenser?

A. No.

Q. Do you believe that you were exposed to asbestos at all in relation to either or both of the Foster Wheeler condensers on board the TURNER?

A. I don't recollect instances that I would have been.

MR. MASTROIANNI: Okay, sir. Those are all the questions I have for now. Thank you.

- - -

EXAMINATION

- - -

BY MR. REICH

Q. This Foster Wheeler — these Foster Wheeler condensers, would it be fair to say

Page 277

that it was pretty hot temperature material that flowed through them?

A. Dispense steam, yes.

Q. Okay. And do you know whether the condenser had any — these condensers had any gaskets in them?

MR. MASTROIANNI: Objection.

BY MR. REICH:

Q. Or seals?

MR. MASTROIANNI: Objection.

THE WITNESS: The connections had to have seals.

MR. REICH: Okay.

THE WITNESS: Like gasket seals. The manhole that we climbed in had to have gasket seals.

BY MR. REICH:

Q. Okay. And to your knowledge from your training what would those seals have been made from?

MR. MASTROIANNI: Objection.

THE WITNESS: I —

BY MR. REICH:

Q. From your training.

Page 278

A. From training I would have said asbestos composite.

MR. MASTROIANNI: Move to strike, calls for speculation, speculative portions.

BY MR. REICH:

Q. Would it have been necessary for those seals or gaskets to be disturbed in any way while you were on the TURNER in the presence of these condensers?

MR. MASTROIANNI: Objection, calls for speculation.

BY MR. REICH:

Q. Do you understand the question?

A. Repeat it, please.

Q. Would it have been necessary to disturb in any way these gaskets or seals on the Foster Wheeler condensers while- you were on the TURNER?

MR.. MASTROIANNI: Same objection.

THE WITNESS: Yes.

BY MR. REICH:

Q. And in what way? Describe that to us.

Page 279

A. If the piping connecting the condenser developed a leak it would to have, and it was at one time,

would require a new seal. And in the salt water version issue the manhole that we went in had to have a seal that was replaced.

Q. Well, tell us a little bit about the seal to the piping that had to be repaired. What had to be done?

A. Removal, scraping, wire brushing as you heard several times.

Q. What happened when the seal was wire brushed and scraped —

MR. MASTROIANNI: Objection, lacks foundation.

BY MR. REICH:

Q. — from the Foster Wheeler condenser?

A. The usual dust, dust cloud.

Q. How far away were you from it?

MR. MASTROIANNI: Objection.

THE WITNESS: Since this was not a normal repair I was right on top of it.

BY MR. REICH:

Q. Actually at one point –

A. If you were working on the wrench, I was right behind you over your shoulder.

Q. Okay. And with regard to the manhole, is it necessary to replace the seal when that manhole is opened and the seal cracked?

MR. MASTROIANNI: Objection.

THE WITNESS: Yes.

BY MR. REICH:

Q. Okay. And what goes into replacing that seal? Is that different kind of seal than the gasket on a flange?

A. Probably because its low temperature.

Q. What does it look like, the seal?'

A. Well if the manhole is about like this with a bunch of lugs coming out, it's a replica of the opening.

Q. And were you involved in the removal or replacement of this seal in any way —

MR. MASTROIANNI: Objection, form.

BY MR. REICH:

Q. — the manhole seal?

A. No.

Q. Were you there when it was being done,

either replaced or removed?

A. Removed.

MR. MASTROIANNI: Asked and answered.

THE WITNESS: I can't recollect where I was when the problem started. This was not a normal problem.

BY MR. REICH:

Q. Was there normal maintenance that was required on the Foster Wheeler condensers?

A. I don't recollect any.

Q. Okay. Do you remember seeing any warning labels with regard to the dangers of asbestos either in the manuals or on the Foster Wheeler condensers?

MR. MASTROIANNI: Objection, form.

THE WITNESS: I don't recollect. I don't — I think I can say I didn't see any warnings on the condenser or the literature.

BY MR. REICH:

Q. Was there any insulation on the outside of the condensers from Foster Wheeler?

* * *

THE BABCOCK & WILCOX COMPANY BARBERTON OHIO BARBERTON OHIO

ORDER NO. #57962 DATE: September 28, 1943
ACC-4875-95
ME-3846-86

TO: FOSTER WHEELER CORPORATION

165 BROADWAY N.Y.C.

SHIP TO: INSTRUCTIONS LATER.

RENDER INVOICE IN TRIPLICATE.

VIA: FOR SHIPPING REQUIREMENTS SEE LAST PAGE.

DELIVERY:

PRICE: per ship, including tools and spares, f.o.b. cars Dansville, N.Y.; all less 9% for resale - Dup. of Contract MB-2761 Class. Progress payments to apply. (See note on last page.)

Acknowledge receipt of this order promptly and state definitely when shipment will be made.

---

84 - Foster Wheeler Navy Type Economizers (42 right hand and 42 left hand), each unit being 10 elements high and 13 elements wide and with two elements omitted for soot blowers and one element omitted for clearance; total 62 elements per unit. Length of elements 7'-0" between support plates. Unit to be built up ready for installation including pressure parts, Crane Co. drain and vent valves with necessary flanges and nipples,

supporting tube sheets, front and rear vestibules, complete with doors. To be duplicate of economizers supplied for DD-445, Class Destroyers on our order number 41058, ME-2761-90.

Drains from Economizer rear casings are to be furnished.

This equipment must be suitable for boilers designed for 684° working pressure and the casing designed for the following.

1. Test pressure for tightness inside economizer door, 10" water.
2. Test Pressure for tightness outside economizer door, 26" water.
3. Test pressure for strength, 55" water.

The heating surface of economizer to be 3,906 square feet.

Economisers to be in accordance with drawings as approved for DD-445 and Class.

These economisers are for (21) ships, each ship requires two right hand and two left hand economisers.

21 - sets of spare parts and tools for (21) ships. Each set to consist of:

16 - Elements
25 - Handhole plugs
992 - Handhole gaskets
4 - Expanders
4 - Tube drivers
8 - 7/8" offset socket wrenches
4 - 1/2" reversible rachet wrenches
2 - Pin spanners
8 - Tube plugs
2 - Plug extractors

2 - Handhole lifting tools
2 - Crimping tools
1 - Air driven tube cleaner

Spare parts should be packed, marked and protected from corrosion in accordance with general specifications for Machinery, section 531-1 including revisions. Please note that spares are to be packed in metal boxes. Spare parts for each ship to be packed separately and marked accordingly.

Please use the attached spare parts form in connection with this order. This is Navy Standard Form for spare parts and one copy, properly filled out, is to be placed inside each spare part box. Two certified copies of this form to be forwarded to the Navy Department as required in specification 531-1 and one copy of this form properly filled out to be sent to us at Barberton. These forms to be forwarded the day shipment is made.

All material subject to inspection at the place of manufacture by a U. S. Navy Dept. Bureau of Ships Inspector.

Please notify the Inspector of Naval materials in your district at least 24 hours before inspection service is required.

The design, material, workmanship, plans, inspection test and performance of the article or articles covered by this order shall be in accordance with the Navy Dept. specification for DD-445 and Class Vessels and all applicable portions of general specifications for Machinery, and all applicable Leaflet Material specifications including all revisions and corrections as of July 1, 1940; any information regarding aforesaid specifications to be obtained on application to the purchaser and not from the Bureau of Bureau's concerned.

By your acceptance of this order you guarantee that the equipment or material to be furnished will operate or function satisfactorily and readily under all service conditions and in accordance with the specification under which the material is purchased. Any failure of this equipment or material to give the specified performance, or any defects in material or workmanship that may develop during the construction, tests or trial of the vessel or until the vessel for which equipment or material is intended is finally accepted by the Navy, shall be made good by you at your expense.

The special specifications applicable to this job insofar as they cover economizers are as follows:

"In order to provide more economical performance of the boilers, each boiler shall be provided with an economizer. Economizer shall be design, capacity, pressure drum, etc., as approved in detail by the Bureau. Each economizer shall serve only the boiler in which installed. The material and design of economizer shall be accepted as submitted in detail by the contractor and approved by the Bureau."

There are no understandings between the parties hereto as to the subject matter of this contract, other than as herein set forth. All previous communications between the parties hereto, either verbal or written, are hereby abbrogated and withdrawn, and the acceptance of this contract with the specifications and drawings referred to herein constitute the whole agreement between the parties hereto. The contract cannot be assigned except by a duly approved supplementary agreement signed by both parties, nor may the general conditions be codified.

The following cancels and supersedes the Guarantee Clause "G" which appears on the back pages of this order.

"The Seller shall defend at its own expense any suit or action brought against the Buyer based on a claim that the equipment, or any part thereof, furnished hereunder constitutes an infringement of any patent of the United States, if notified promptly in writing and given authority, information and assistance for the defense of same, and the Seller shall pay all damages and costs awarded therein against the Buyer. In case the equipment of any part thereof is in such suit held to constitute infringement and its use is enjoined, the Seller shall, at its own expense, either procure for the Buyer the right to continue using said equipment; or replace same with non-infringing equipment; or modify it so it becomes non-infringing; or remove said equipment and refund the purchase price and the transportation and installation costs thereof."

Economizers must be delivered free from dirt, chips, or any other foreign substance. Economizers must be properly protected internally and externally with a suitable rust preventive compound.

The material or articles called for by this order are to be used exclusively for fabrication of boilers, and are covered by priority rating listed below. Please wire us immediately if you receive a priority rating or request or instructions of any nature from any source whatsoever, that in any way interferes with or defers your producing and shipping the articles or materials called for as scheduled herein.

The vendor by acceptance of this order, accepts the provisions of the "NATIONAL DEFENSE CONTRACT CLAUSE", as outlined in the attached memo.

Required for (86) Marine boilers for (21) Destroyer Class DD-445 Vessels applying on Federal S.B. & D.D. Co. order (Gibbs & Cox) DD-809/O&C-209. and Navy Contract No. NObs-1107.

Ship Nos.	Shipyard
DD-528 to DD-549	Bath Iron Works, Bath, Maine

RICHARD C. JOHNSON — BY MR. STUEMKE

* * *

Page 11

Q. Okay. So what year does that take us to, sir?

A. Frankly, I have a hang-up as to whether it was '95 or '96. It was either 1995 or 1996 — wow, 1955 or 1956. I believe it was '55.

Q. Could you briefly describe generally the job titles and responsibilities that you held at Foster Wheeler over the 40 years of your career there?

A. I began as a metallurgical technician. Foster Wheeler had a branch of the Research Department in the Dansville plant, which is the area where I resided, and as such they had a metallurgist who was employed full-time at Foster Wheeler. He hired me as an assistant as in about a year, as time went by, we noticed there were many ceramic activities taking place, so I gradually assimilated some of the ceramic — some of the research and development and applications related to non-metallic materials.

Q. Let me interrupt you for just a second, sir. You said you graduated from New York State College of Ceramics; is that right?

A. Yes, sir.

* * *

Page 66

Q. I am handing you what has been marked Exhibit 8.

MR. BRYDON: Do we have a copy not marked up?

MR. STUEMKE: No, actually, on this one I am afraid we don't. The highlights won't come through on the copying.

Q. Okay. Sir, do you recognize Exhibit 8?

A. I recognize it as an engineering standard for hi-temp blocks.

Q. Is this a document prepared by Foster Wheeler?

A. Yes.

Q. What is the purpose of this form or this document?

A. These documents called "Engineering Standards" were compilations of the materials that were available for utilization in the boilers. And the properties on them were supplied by the individual suppliers of the materials and this was to enable a bidder to know which types of materials he could use when that category of block is specified.

Q. And —

* * *

* * *

Page 72

A. That is correct.

Q. Sir, are you familiar with how engineering standards such as Exhibit 8 were maintained by Foster Wheeler in the regular course of its business?

A. Foster Wheeler had a bound book of standards for insulation and castable brick materials as well as many other materials. And again, these were lists of available materials for specific categories.

Q. Okay. Where were those maintained?

A. They were maintained in the Contract Design Department in the main office. They were originated there.

Q. When you say "in the main office," is that in New York City?

A. Like one time New York, one time Livingston, one time Perryville.

Q. How many copies of those bound books were there at any one point in time, was there one master copy and daughter copies of that or —

A. To my knowledge, there was a master copy and as you say, daughter copies were given to appropriate personnel within the company for

* * *

Page 114

A. Yes, sir.

Q. So whoever is working on a contract at Foster Wheeler's — whoever is working for Foster Wheeler

on a contract is legally bound to use the insulation materials that are in accordance with this Insulation Standard Catalogue, correct?

A. I don't know legally bound but if he is going to supply his material, it is logical to assume that it should be on this standards list (indicating).

Q. Well, it says here "legally binds the vendor or contractor to adhere to this information," correct?

A. Yes.

Q. For instance, if a subcontractor decided that he wanted to use feathers to insulate the outside of a boiler, he couldn't do that within the terms of the contract, correct?

A. If he wanted to change the material, you mean?

Q. If he wanted to put feathers on?

A. That is correct.

Q. But feathers aren't in the Insulation Standard Catalogue?

* * *

Page 165

Q. It is reasonable to believe that Foster Wheeler knew asbestos insulation was being used on its boilers in the 1930s?

A. I don't know.

Q. Does it strike you as reasonable?

MR. BRYDON: The question is argumentative. For the record, even the deposition notice here begins in the 1940s. That is all he is being produced on is knowledge in the 1940s. You are getting argumentative and I think borderline harassing on this.

MR. STUEMKE: That is a bit strong. I am asking him if it is reasonable to believe that. He can testify if it's reasonable or not. You are right, the notice says "1940," so I will ask him specifically about 1940 which he is being produced to testify to.

Q. Sir, in 1940 did Foster Wheeler know that asbestos products were being used on its equipment?

A. Yes, its' obvious they had to know in some cases.

Q. And in what cases would those be?

A. Where asbestos is right on the standards, asbestos rope, asbestos cloth, asbestos cement.

Page 166

Q. And those are the standards drafted by Foster Wheeler, correct?

A. They were approved — they were materials that were specified for use in specific required applications, yes.

Q. Going back to 1940?

A. I wasn't there in 1940 but from what I had learned in 1940, they would have been using these products, I assume that.

Q. Going back to the fact that — and I appreciate sometimes in this deposition you have said what you, Dick Johnson, know personally from your experience but I am asking you Foster Wheeler, in 1940, were you aware that asbestos products were being used in association with your equipment?

MR. BRYDON: That question is argumentative as phrased and it has been asked and answered.

But go ahead.

A. Yes.

MR. STUEMKE: Thank you. At this time, why don't we break for the day.

(There was a discussion off the record.)

* * *

Page 226

Q. That wouldn't burn?

A. It would burn. That was its function.

Q. The function of the spacers was to be consumed?

A. Yes, it was there to allow for initial expansion of the brick. I wouldn't expect any asbestos to live in an environment where fire brick has been specified.

Q. Are you familiar with a product called metal paste brick?

A. I have heard of it. I have a rough appreciation for what it is.

Q. Is that a product that was ever used by Foster Wheeler?

A. Not to my knowledge.

Q. Sir, you mentioned that asbestos-containing gaskets were used in association with Foster Wheeler equipment; is that correct?

A. Yes.

Q. And that would have been — well, where would those gaskets have been used on say a packaged generator manufactured in Dansville?

A. You will have to define the type of

Page 227

gaskets in that what often is referred to as a gasket really is an insulating tape on a doorway. Do you want to include that in the gasket category or just the gaskets that are used to contain pressure within two metal flanges?

Q. For right now, why don't we go ahead and include the tape as well.

A. Okay. Gaskets were used where there would have been a high-pressure connection or a connection for a high-pressure steam or water line. These connections were flanged and when they — when the connection was effected, a gasket was put in to form a compressable resistance to any leakage at that metal flange point. As far as the tapes were concerned, every unit had to have an access door in order to enter and if an access door which had a metal flange was closed and was not properly insulated, the gases would leak in or out of the unit. So a woven metal — pardon me, a woven asbestos tape up to a quarter of an inch thick was simply adhered around the outside of the opening and if there was an opening on a larger unit such as a condenser. I do now recall a condenser being made at Dansville.

Page 228

Q. Okay.

A. They would have larger areas which the tape would be adhered to for closure when they were installed probably in the field.

Q. Okay. So those asbestos gaskets and tape would have been incorporated within the Foster Wheeler product when it left the factory?

A. Yes, there were encapsulated gaskets and tapes on different products that left the factory.

Q. Okay. And with respect to field-erected equipment, there was — there were asbestos-containing gaskets utilized in connection with that type of equipment as well, correct?

A. It's logical to assume that there would have been, yes.

Q. You also testified yesterday about the usage of asbestos cloth in association with Foster Wheeler equipment; do you recall that?

A. Yes, sir.

Q. And how would asbestos cloth have been used in association with Foster Wheeler equipment?

A. Asbestos cloth was used in two areas. One, it sometimes was draped over a steel frame to protect any passers-by from weld splatter or the

arc of the weld processes. It also was used in stress-relieving operations where an electrical — electrically-induced coil was wrapped around a pipe configuration between 4 and 40 inches in order to heat the pipe.

Because it had to be insulated from the pipe, sometimes the cloth would be placed between the wrapping of the electric element and the pipe. Sometimes a blanket was used. Asbestos cloth, sometimes in rare circumstances if a gasket wasn't available that should have been made out of a sealed closure, such as the condenser I mentioned, somebody might cut a gasket or whatever you want to call it, cut a closure device, but let's call it a gasket, out of 1/8-inch thick

cloth to the shape that it would be protecting on a flanged element

Lastly, the cloth was used someties to — when a welder was completing a weld, the tube he was welding would get very hot and therefore to protect himself, he chose to insulate himself with a piece of cloth that had been used for the induction heating. Those were the major areas where cloths were used.

Q. Okay.

* * *

JOHN B. DeVRIES

* * *

Page 81

Q. Do you know who manufactured any of the turbines aboard the USS TURNER?

A. General Electric.

THE VIDEOTAPE OPERATOR: Excuse me, counselor. There's five minutes left on the video.

MR. STOKES: Thank you.

BY MR. STOKES:

Q. Do you recall if any maintenance or repair work was performed in your vicinity around any of the steam — steam generators.

A. What do you mean by steam generators?

Q. I believe you testified that there were steam generators aboard the ship?

A. Well, that's a boiler.

Q. Okay. So a boiler and a steam generator are the same thing?

A. I don't remember where steam generator came into our conversation.

Q. Okay. I'm sorry. Maybe I misheard you. In any event, the boilers you testified they were all manufactured by Babcock and Wilcox; correct?

A. Correct.

* * *

Page 310

MR. KATTNER: I'd be glad to do so.

MR. REICH: I appreciate that.

BY MR. KATTNER:

Q. Okay. All right. Maybe we can approach it this way. One piece of equipment that you attribute to General Electric is the main propulsion turbine; is that correct:

A. Yes.

Q. Okay. And if you could turn to your Exhibit 2, do you have that in front of you?

MR. REICH: We will in a minute.

MR. KATTNER: That's the 1945 and then the hull data. Oh, he has it in front of him.

THE WITNESS: I have it in front of me.

BY MR. KATTNER:

Q. Okay. Sir, you'll agree that the first page of Exhibit 2 appears to be from the supervisor of shipbuilding, U.S. Navy, Bath, Maine dated June 9, 1945. subject references, among other things, the USS TURNER DD 834; is

Page 311

that correct?

A. Yes.

Q. And I understand you were not present at the time this activity occurred; is that correct?

A. Yes.

Q. All right. Under B it states, Certificate as to condition of machinery. And I'll read, it says, It is hereby reported that the machinery of the subject vessel including engines, boilers, appurtenance, spare parts is strong and well-built and in strict accordance with drawings, specifications, and duly authorized

changes therein except for listed on the work list cards furnished the Board. Is that correct?

A. I read it the same.

Q. And my understanding is the reference to engines includes the propulsion unit or the turbine by your understanding as an officer in the Navy?

A. Yes.

Q. Now, did you review the specifications that the Navy made for the turbine on the ship

at any point in your career?

A. Yes.

Q. For purposes of doing your job as an engineering officer?

A. As reference material for —

Q. I've got you. And there were copies of these specifications on the ship, were they or not? Some were, some weren't?

MR. REICH: But can you —

MR. KATTNER: Okay. I didn't mean to cut him —

MR. REICH: Okay. Slow down.

MR. KATTNER: I'll slow down. Yes.

MR. REICH: Thank you.

BY. MR. KATTNER:

Q. Go ahead, sir.

A. Your observation is right. Some were, some weren't.

Q. Okay. And you can't tell us specifically which specs were on the ship and which weren't, can you, at this point?

A. I cannot recollect.

Q. But that was a decision made by the

* * *

Page 330

Q. Yes.

Q. Okay.

MR. REICH: You are just talking in general about —

MR. KATTNER: I'm talking in general right now.

MR. REICH: Okay.

BY MR. KATTNER:

Q. With respect, however, to the selection of what insulation was put on the turbine on the TURNER at the time of its initial installation in 1945, I take it you have no knowledge as between the equipment manufacturer or the shipbuilding in Bath, Maine who selected that insulation, do you?

A. I have no knowledge.

Q. And with respect to the Navy specifications as to use of asbestos or other materials on turbines or other machinery you do not have personal knowledge as to what besides asbestos the Navy may have specified?

A. I have no personal knowledge of it.

Q. Okay. Now, and with respect to specifications that might say the equipment

Page 331

manufacturer would state temperature ranges and then the shipbuilder would select insulation, again, that's not something you personally even became involved in?

A. True.

Q. Okay. Now, in this first three months, forced draft blower work before Boston, you were present when ship's crew and in command of them when they ripped out the insulation; correct?

A. I was present.

Q. Did you breathe dust from their operation?

A. I breathed dust from whatever they did because we had a dust cloud. And I — I was there for two reasons. I was there to learn.

Q. I see.

A. And I was there for whatever other supervisory reason.

Q. And I think you answered yesterday — well, let me ask you this. As to the dust that came from the forced draft blower itself versus other pieces of equipment you cannot differentiate at this point, can you?

Page 332

A. I can't — I cannot differentiate between the boiler and the draft blower for example.

Q. Okay. And with respect to whether that insulation that was then removed had been original to the ship or replacement over the years before you don't know?

A. I have no way of knowing.

Q. And as to who had originally supplied the first round of insulation you don't know?

A. I have no way.

Q. And if there were any replacements you don't know who supplied that insulation that was ripped out?

A. Yes.

Q. You just don't know?

A. (The witness nods.)

Q. Is that correct?

A. Just don't know.

Q. Okay. And then after these initial repairs were done in this dry dock in the first three months or so was the insulation replaced on the forced draft blowers before the ship went to Boston?

* * *

Page 353

USS TURNER, you mentioned that somewhere around the holidays near Monte Carlo there was some further work on one of the turbines that kept you on the ship while others were able to get off; correct?

A. Easy to remember.

Q. Understood. And I understand that the turbines were open to check stress bearings was your testimony?

A. I believe they were open to check a bearing.

Q. Got you. In terms of your personal presence during the operation of that — in that Monte Carlo stress bearing series of events, were you present when the insulation was ripped off or not?

A. Yes.

Q. You were present in —

A. I was present when the insulation was ripped off.

Q. And was that the same insulation that had been installed at the Boston overhaul? It was ripped off there? Or it was the blankets and something else? What was it?

Page 354

A. I can't be sure it was the same, but I don't recollect any replacement of insulation prior.

Q. I see. But you weren't — you don't know what or who supplied the insulation that the Boston shipyard had put on in terms of the mud?

A. I do not.

Q. And in terms of whether they used the same or different blankets back on at the Boston overhaul you weren't there to see that either?

A. I wasn't there. I wasn't there to see things put back together.

Q. But from being on the ship, it was mostly at sea during the intervening time, correct, before this Monte Carlo holiday turbine incident?

A. Yes.

Q. And you don't know of any other work done to disturb the insulation on the turbine before this Monte Carlo holiday incident?

A. Yes.

Q. You do or you don't?

Page 355

A. I do not.

Q. You do not know. So the next thing you know was this thing at Monte Carlo?

A. We need to open and check.

Q. And was it the ship's personnel or yard personnel who took the insulation off, ripped it off?

A. Ship's personnel.

Q. I got you. And then the cover was taken off the turbine. And what repair was made, to your understanding?

A. A problem part was removed. We were fortunate to have the services of the machine shop on a — I guess it was a cruiser moored in Villa, France. And the part was duplicated by that vessel and — and the new part reinstalled by our people.

Q. And these internal parts is it safe to say they were real metal parts?

A. These were metal.

Q. And you don't — you personally don't associate any asbestos with any of the internal parts involved in that?

A. Not with the internal parts.

Page 356

Q. In fact, the inside of the turbine is kept relatively clean —

A. Clean.

Q. — metal; correct?

A. Yes.

Q. It has to be for its function?

A. It has to be.

Q. Is that correct?

A. Yes. It has to be clean.

Q. Then the turbine was covered back up?

A. The cover was put back on and the —

Q. Insulating blankets —

A. Insulation however could be put back on was reinstalled.

Q. Were you present when it was re-insulated?

A. I was present when it was re-insulated. I was present through the whole process.

Q. Now, when you say through the whole process, I'm just asking realistically was this every single minute the people were working or in and out of the area where they were working on that?

A. Any time the turbine was being worked on

or opened.

Q. I see. That included the rip out and the re-insulation process?

A. That included the rip out and the removal of the insulation and going further the dust from that event.

Q. And at the time of this Monte Carlo turbine repair on the USS TURNER, were you the engineering officer in charge or were you not yet there?

A. I was responsible. I don't remember whether I was the engineering officer or not.

Q. So whether you had —

A. I would have had to have been engineering officer because I wasn't able to leave because the TURNER — the turbine was open.

Q. So you were the officer that the Navy had in charge of that operation?

A. I was responsible.

Q. And the people doing the job worked under your orders?

A. Yes.

Q. And with respect to the procedures they

did, I take it you directed them to follow the procedures in accord, as you have said many times, with the combination of what was in the manufacturers' manuals or what the Navy had trained you to do; correct?

A. Yes.

Q. And is it your understanding that the workers doing that job were required to do what you as the Naval officer told them to do?

A. Yes.

Q. And with respect to masks, respirators or dust protection, did you give any special orders during that Monte Carlo repair?

A. No.

Q. Did you see any contradiction at any — you have already told me that. I'm not going to go back there.

Now, were there any further repairs to disturb the insulation on the turbine after that Monte Carlo incident and before you left the USS TURNER that you recall?

A. Yes.

Q. And what else happened?

Page 359

A. The Navy had the TURNER go through a repair, a program called FRAM, fleet rehabilitation and maintenance. FRAM was scheduled for Brooklyn Navy Yard. The captain and I developed work lists, work orders for FRAM. We developed work orders that would check all important or portions of the ship including the turbines.

Q. Okay. And I'm sure again ship records will be available at some point and they may show more detail about this. I'm going to ask your recollection here.

I believe your testimony was the ship physically was in the Brooklyn Naval Yard during the last part of your service on the USS TURNER; is that correct?

A. I was on the ship while in the yard and separated from the Navy while the ship was still in the yard.

Q. Just trying to get the dates nailed down. You separated from the Navy what date?

A. It would have been June 1960.

Q. Okay. Before or after the Kennedy Nixon TV debat ?

Page 360

But in any event. June 1960 you separated from the Navy. The ship was in the Brooklyn Navy Yard at that time?

A. Yes.

Q. For its FRAM overhaul?

A. The work was ongoing.

Q. Got you. And how long before you separated had the ship arrived in Brooklyn Navy Yard by your recollection?

A. I don't recollect. The removals were well underway.

Q. What I'm trying to get was it two weeks or a half a year>

A. Several weeks.

Q. Several weeks.

A. Maybe several months.

Q. Okay. So to estimate, your best recollection is some time in early 1960 it arrived at the Brooklyn Navy Yard for the beginning of the FRAM, but you don't remember exactly when?

A. I wouldn't say early '60, but, yes, it was spring of '60.

Q. Fair enough estimate. And then in

* * *

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JOSEPH BEAUSEJOUR and PATRICIA BEAUSEJOUR	:	PHILADELPHIA COUNTY COURT OF COMMON PLEAS CIVIL DIVISION
Plaintiff(s)	:	ASBESTOS CASE
v.	:	SEPTEMBER TERM, 2007
A.W. CHESTERTON, INC., et al.	:	
Defendant(s)	:	No. 2778

1. DEFENDANT GENERAL ELECTRIC COMPANY'S ANSWERS, RESPONSES AND OBJECTIONS TO PLAINTIFF'S INTERROGATORIES AND REQUESTS FOR PRODUCTION

Defendant, General Electric Company ("GE"), by and through its undersigned counsel, and pursuant to Pa.R.C.P. 4005 and 4009.1, hereby files its answers, responses and objections to plaintiff's interrogatories and requests for production as follows:

2. PRELIMINARY STATEMENT AND GENERAL OBJECTIONS

1. GE generally objects to Plaintiffs' Interrogatories and Request for Production on the grounds that they are overly broad, unreasonably burdensome, oppressive, expansive, not reasonably tailored to this case and the issues therein, and not reasonably calculated to lead to the discovery of admissible evidence. Plaintiffs' discovery should be addressed to the products to which plaintiff was allegedly exposed at a particular place and time. Without such specificity, it is impossible for GE to respond and the discovery is simply a fishing expedition.

* * *

purports to go beyond the product that GE understands to be primarily at issue with respect to GE in the above-captioned matter. Subject to and without waiving the foregoing and any of its objections, GE incorporates its Answers to Interrogatory No. 6 by reference as if fully set forth herein.

28. When did you first become aware that airborne dust containing asbestos fibers or fibrils would be created in use or removal of your asbestos products by an insulation worker or other workers could cause asbestosis, pleural thickening or pleural plaque, mesothelioma, or lung cancer? Please identify the date of this knowledge by product whether raw asbestos or a finished product and the date of knowledge that each of the diseases set out could develop from exposure to asbestos.

ANSWER: GE objects to this Interrogatory to the extent that it is overly broad, unduly burdensome, and not reasonably calculated to lead to the discovery of

admissible evidence. Subject to and without waiving any of its objections, GE notes that the amount of materials published in both the technical and popular press that discuss possible correlation between exposure to asbestos at sufficient levels, especially friable, amphibole asbestos, and human health consequences is voluminous and GE is unable to state on what specific date it first became aware of a possible correlation between exposure to asbestos at sufficient levels and human health. GE further states that because it is a large, decentralized company with facilities in numerous states and foreign countries, and because there is no central repository for information of the type sought by way of this interrogatory, GE may no longer have, or never have had, many of the documents required to fully answer this interrogatory. GE reserves the right to supplement its response.

However, at all times GE's respective businesses and the personnel of the respective businesses kept apprised of the government standards, regulations, and laws, as well as prevailing safety standards, industry standards, and standards of medical art as they related to the operation of GE's respective businesses. GE notes that the term "asbestosis" was first coined in 1928 and that in the 1930s GE medical personnel and consultants would have been aware of the ability of exposure to certain dusts, such as silica, coal, cotton, and asbestos at sufficient levels to cause pneumoconiosis. By the early 1950s, Dr. Irving R. Sax of its Schenectady office was aware of the risk of asbestosis from high levels of exposure to asbestos dust and Dr. Sax made this information publicly available in his book, Handbook of Dangerous Materials (Reinhold

Publishing 1951). Likewise, Dr. John Grimaldi, a consultant for health and safety for GE from 1956 to 1967, published in 1956 a treatise on industrial hazards (entitled "Safety Management") which included a caution on the hazards of asbestos. A second edition of this treatise was published in 1963). Further, GE would have been aware of the threshold limit values ("TLVs") first promulgated by the American Conference of Governmental Industrial Hygienists ("ACGIH") and adopted by ACGIH at or about 1946 and permissible exposure limits ("PELs") when first enacted by OSHA in the early 1970s for a variety of substances. GE would have been aware of state industrial codes adopting TLVs and the Walsh-Healy requirements that all federal government contractors meet the ACGIH standards. GE also would have been aware of the "Minimum Standards" issued by the U.S. Navy in 1943. Likewise, customers for the GE products discussed in these discovery, responses are, and were typically sophisticated entities such as the government, utilities, ship owners, shipbuilders, and industrial manufacturers who also would have been aware of TLVs, maximum allowable concentrations ("MACs"), PELs, and other standards promulgated by various governmental organizations and professional associations. A copy of Dr. Sax's book can be made available upon request at a mutually convenient time and place. Documents concerning GE's knowledge can be made available for review at a mutually agreeable time and place.

* * *

(b) Tests or studies by any independent organization;

(c) Tests conducted on humans or animals on your behalf or on behalf of any co-defendant in this action. If your answer to any of the subsections (a) through (d) is in the affirmative, for each test or study state:

(1) The date it began;

(2) The date ended;

(3) The procedure of the test or study;

(4) The number of man hours spent on it;

(5) The place where it was conducted.

ANSWER: GE objects to this Interrogatory on the grounds that it is overly broad, not time, site or product specific, unduly burdensome, and not reasonably calculated to lead to the discovery of admissible evidence. Furthermore, as set forth in its Preliminary Statement and General Objections, *supra*, incorporated herein, GE objects to the extent that this Interrogatory purports to go beyond the product that GE understands to be primarily at issue with respect to GE in the above-captioned matter. Subject to and without waiving the foregoing and any of its objections, GE incorporates its Answers to Interrogatory No. 6 by reference as if fully set forth herein.

33. Have you, at any time, been a member of any "trade association or organization" composed of other miners, manufacturers, suppliers, distributors, producers, processors, compounders, converters, sellers, merchandisers, and/or anyone otherwise placing in the stream of commerce asbestos products? If so, state:

(a) Identify each such association or organization;

(b) The dates during which you were a member;

(c) The names of any publication published by or written by such association or organization;

(d) The dates and addresses of all other members;

(e) What meetings you attended and identify who attended;

(f) Who spoke at such meetings;

(g) Were transcripts or summaries or minutes or notes made of such meetings? If so, identify the above, tell specifically what was made and give the name, title and address of the person or persons who have custody of the transcripts and/or summaries and or minutes and/or notes mentioned above and state when and where counsel for the plaintiff may examine and copy these documents.

ANSWER: GE objects to this Interrogatory on the grounds that it is overly broad, unduly burdensome, not reasonably tailored to the issues of the case, and not reasonably calculated to lead to the discovery of admissible evidence. Subject to and without waiving the foregoing or any of its objections, GE answers as follows:

GE is not now, nor has it ever been, a miner, miller, importer, distributor, or marketer of raw asbestos fiber, nor been in the (regular) business of selling raw asbestos fiber; nor has it manufactured asbestos-containing thermal insulation products. GE has never been a member of the asbestos industry as that term is commonly used, nor has it ever been a member of the trade organizations of the asbestos industry. Answering further, upon information and belief, some of GE's employees were members of the National Safety Council ("NSC") in the early 1900s. GE has not been

able to locate historical materials in its possession received from the NSC or which relate to the NSC other than materials which post-date 1991. These post-1991 documents were located in a file maintained by GE's Corporate Environmental Programs in Fairfield, Connecticut, and include a number of brochures on safety related matters — *e.g.*, defensive driving — and records showing that GE paid its NSC membership dues during various times in the 1990s. GE has obtained copies of the NSC's periodicals National Safety News and NSC Transactions. Upon request, GE will produce copies of these documents to Plaintiffs' counsel at a mutually convenient time and place. Further, GE states that it has also been brought to GE's attention through historical documents produced by other parties in asbestos-related litigation that some of its employees were members of the NSC at some points in their individual careers. Upon request, GE will produce copies of these documents to Plaintiffs' counsel at a mutually convenient time and place. A review of these historical NSC materials reflects that over the last nine decades, dozens of GE employees have contributed time and resources to various NSC committees and served as Board members.

GE is continuing to search for documents in its own files confirming membership in the NSC with its own records historically, but, other than the aforementioned materials, none have yet been located. GE's investigation continues and it reserves to supplement this response if additional relevant material becomes available.

Upon information and belief, in 1947, GE became a member of the Industrial Hygiene Foundation ("IHF"), an association of industrial hygiene professionals

from government, academia, and industry which shared technical information relating to current industrial hygiene topics about numerous industrial materials among its members. GE has not been able to locate historical materials in its possession received from the IHF. Investigation continues. It has also been brought to GE's attention through documents produced by other parties in asbestos-related litigation that some of its employees were members of the American Ceramics Society at some points in their individual careers. However, GE has not been able to locate these documents in its own files, and therefore cannot attest to their authenticity. Investigation continues. Nonetheless, upon request, GE will produce copies of these documents to plaintiffs' counsel at a mutually convenient time and place. GE further states that it has not been able to locate historical materials in its possession received from the American Ceramics Society. Investigation continues. GE further states upon information and belief that certain GE's businesses were at various points in time members of the National Electrical Manufacturers Association ("NEMA"), and that GE President Gerard Swope was the first President of NEMA. Additionally, some of GE' s employees may have been members of the American Conference of Governmental Industrial Hygienists ("ACGIH") at some points in their individual careers. GE has not been able to locate historical materials in its possession received from the ACGIH during the relevant time period. GE further states, however, that it is continuing to search for documents in its own files confirming its historical membership in the ACGIH.

Upon information and belief, some of GE's employees are currently members of the American Industrial

Hygiene Association. However, GE has not been able to determine whether any of its employees previously may have been members of the American Industrial Hygiene Association at some points in their individual careers or whether GE received any historical materials from the American Industrial Hygiene Association. Investigation continues and GE reserves the right to supplement its response accordingly.

By way of further response, and to the extent that this Interrogatory seeks additional information GE states that because GE is a large, decentralized company with facilities in numerous states and foreign countries, and because there is no central repository for information of the type sought by way of this interrogatory, GE may no longer have, or may never have had, the documents required to more fully answer this interrogatory. GE is a large, decentralized company comprised of numerous separate businesses with over 300,000 employees. GE operates in more than 100 countries around the world, and since 1979, GE has bought and/or sold thousands of businesses. See http://www.ge.com/investors/financial_reporting/annual_reports.html.

* * *

calculated to lead to the discovery of admissible evidence. Subject to and without waiving any of its general and specific objections, GE states that it is a large, decentralized company that maintains no such library or collection of literature related to the subjects of asbestos, industrial hygiene, medicine, safety and/or occupational disease in any centralized location. However, GE states that at all times its respective businesses and the personnel of the respective businesses

kept apprised of the government standards, regulations, and laws, as well as prevailing safety standards, industry standards, and standards of medical art as they related to the operation of GE's respective businesses. Further, GE's employees of its myriad divisions, plants, offices, and other facilities over the years may have maintained individual libraries and collections particularized to the businesses in which they were engaged. GE, however, has never been a member of the asbestos industry, as that term is commonly understood, and instead has historically been a manufacturer of electrical equipment and appliances for both industrial and consumer applications. It is impossible, given the size of the company, its decentralized structure, and the diversity of its businesses and facilities, to determine the type, size, and contents of any libraries or collections of literature and other materials that may have been maintained at individual sites over the years, or the employees who may have been involved in maintaining them. By way of further response, GE currently maintains a general medical library at its corporate offices located at 3135 Easton Turnpike, Fairfield, Connecticut.

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By: /s/ Justin S. Walker
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Justin S. Walker
Counsel for General Electric Company

Date: 1/16/2007

No. 17-1104

IN THE

Supreme Court of the United States

AIR AND LIQUID SYSTEMS CORP., CBS CORPORATION, AND FOSTER WHEELER LLC,

Petitioners,

v.

ROBERTA G. DEVRIES, Administratrix of the Estate of John B. DeVries, Deceased, and Widow in her own right,

Respondent.

INGERSOLL RAND COMPANY,

Petitioner,

v.

SHIRLEY MCAFEE, Executrix of the Estate of Kenneth McAfee, and Widow in her own right,

Respondent.

On Writ of Certiorari to the United States Court of Appeals for the Third Circuit

JOINT APPENDIX (VOLUME II OF II)

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(continued from front cover)

TABLE OF CONTENTS

Page

VOLUME I

Docket Entries,
In re: Asbestos Products Liability Litigation (No. VI), No. 16-2669 (3d Cir.) 1

Docket Entries,
In re: Asbestos Products Liability Litigation (No. VI), No. 16-2602 (3d Cir.) 3

Docket Entries,
In re: Asbestos Products Liability Litigation (No. VI), No. 15-2667 (3d Cir.) 5

Docket Entries,
In re: Asbestos Products Liability Litigation (No. VI), No. 15-1278 (3d Cir.) 7

Docket Entries,
McAfee, et al. v. 20th Century Glove Corp. of Texas, No. 5:13-cv-06856-GJP (E.D. Pa.) 10

Docket Entries,
DeVries, et al. v. General Electric Co,, et al., No. 5:13-cv-00474-ER (E.D. Pa.) 13

Materials from District Court Proceedings

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 269-1, pages 2–18) (excerpts of Exhibit A to Motion for Summary Judgment filed by CBS Corporation) 22

TABLE OF CONTENTS
(continued)

Page

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 269-2, pages 2–38) (excerpts of Exhibit B to Motion for Summary Judgment filed by CBS Corporation) 46

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 270-1, pages 2–53) (excerpts of Exhibit A to Motion for Summary Judgment filed by General Electric Company) 90

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 270-2, pages 2–19) (excerpts of Exhibit B to Motion for Summary Judgment filed by General Electric Company) 224

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 270-3, pages 7, 25, 33–34, 50–51, 56, 62) (excerpts of Exhibit C to Motion for Summary Judgment filed by General Electric Company) 259

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 273, pages 14–49) (Exhibits A-C to Motion for Summary Judgment filed by Imo Industries, Inc.) 266

TABLE OF CONTENTS
(continued)

Page

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 274, page 16) (excerpt of Exhibit A to Motion for Summary Judgment filed by Air & Liquid Systems Corporation) 361

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 277-4, pages 1–4) (excerpts of exhibits to Motion for Summary Judgment filed by Foster Wheeler LLC) 362

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 291, pages 13, 17, 19–22) (excerpts of Exhibit A to Answer to Motion for Summary Judgment of Foster Wheeler LLC) 369

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 291, pages 27–29) (excerpts of Exhibit B to Answer to Motion for Summary Judgment of Foster Wheeler LLC) 383

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 291, pages 33, 35) (excerpts of Exhibit C to Answer to Motion for Summary Judgment of Foster Wheeler LLC) 389

TABLE OF CONTENTS
(continued)

Page

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 291-1, pages 1–8) (excerpts of Exhibit C to Answer to Motion for Summary Judgment of Foster Wheeler LLC, continued) 391

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 294, pages 15–19) (excerpts to Exhibit A of Answer to Motion for Summary Judgment of General Electric Company) 398

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 294-3, pages 3–10) (excerpts to Exhibit G of Answer to Motion for Summary Judgment of General Electric Company) 410

VOLUME II

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296, pages 20–22) (excerpts to Exhibit A of Answer to Motion for Summary Judgment of CBS Corporation) 420

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296-1, pages 9–13) (Exhibit C of Answer to Motion for Summary Judgment of CBS Corporation) 427

TABLE OF CONTENTS
(continued)

Page

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296-2, pages 18–21) (excerpts of Exhibit F of Answer to Motion for Summary Judgment of CBS Corporation)..... 437

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296-2, pages 30–31, 34–36) (excerpts of Exhibit G of Answer to Motion for Summary Judgment of CBS Corporation, continued)..... 443

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296-2, page 45 — Doc. 296-3, pages 1–2) (excerpts of Exhibit H of Answer to Motion for Summary Judgment of CBS Corporation)..... 448

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (excerpts of Exhibit H of Answer to Motion for Summary Judgment of CBS Corporation, continued)..... 453

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 296-3, pages 8–9) (Exhibit I to Answer to Motion for Summary Judgment of CBS Corporation)..... 459

TABLE OF CONTENTS
(continued)

Page

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 297, pages 16–22, 28–29) (excerpts of Exhibits B & C of Answer to Motion for Summary Judgment of IMO Industries, Inc.) 463

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 298, page 19) (excerpts of Exhibit A of Answer to Motion for Summary Judgment by Buffalo Pumps, Inc) 472

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 298-2, pages 7–8) (excerpts of Exhibit D of Answer to Motion for Summary Judgment by Buffalo Pumps, Inc.) 473

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa.) (Doc. 298-4, pages 6–10) (Exhibit J of Answer to Motion for Summary Judgment by Buffalo Pumps, Inc.) 480

McAffee v. 20th Century Glove Corp., No. 13-06856-ER (E.D. Pa.) (Doc. 171, pages 18–31; 33–43) (excerpts of Exhibits A & B of Ingersoll Rand Company's Motion for Summary Judgment) 486

TABLE OF CONTENTS
(continued)

Page

McAffee v. 20th Century Glove Corp., No. 13-06856-ER (E.D. Pa.) (Doc. 203, pages 16–19, 22–24, 30–31, 37–49) (excerpts of Exhibits A, B, & C of Answer to Motion for Summary Judgment of Ingersoll-Rand Company) 557

McAffee v. 20th Century Glove Corp., No. 13-06856-ER (E.D. Pa.) (Doc. 203-1, pages 1–2, 31–50) (excerpts of Exhibit D of Answer to Motion for Summary Judgment of Ingersoll-Rand Company) 593

McAffee v. 20th Century Glove Corp., No. 13-06856-ER (E.D. Pa.) (Doc. 203-2) (excerpts of Exhibit D of Answer to Motion for Summary Judgment of Ingersoll-Rand Company, continued) 642

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa., October 3, 2014) (order awarding summary judgment to Warren Pumps) 745

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa., October 3, 2014) (order awarding summary judgment to IMO Industries, Inc.) 757

DeVries, et al. v. General Electric Company, et al., No. 13-cv-474 (E.D. Pa., October 10, 2014) (order awarding summary judgment to General Electric Company) 770

TABLE OF CONTENTS
(continued)

Page

Materials from Third Circuit Proceedings

DeVries, et al. v General Electric Company, et al., No. 15-1278 (3rd Cir.) (Joint Appendix 729) 782

DeVries, et al. v General Electric Company, et al., No. 15-1278 (3rd Cir.) (Joint Appendix 1508-12) 784

DeVries, et al. v General Electric Company, et al., No. 15-1278 (3rd Cir.) (Joint Appendix 1540-42) 797

Addendum A to Brief of Defendant-Appellee General Electric Company, No. 16-2602 (3d Cir.) 803

* * *

Page 389

Q. And do you recall whether or not that was insulated in any way?

A. Not to my recollection. It was powered by I guess a diesel engine and being emergency it was rarely used when I was on board ship. And it was in a space removed from the main engine rooms and boiler rooms.

Q. And would — strike that. Okay. With regard to the forced draft blowers that counsel asked you about earlier, first of all, how many forced draft blowers from Westinghouse do you recall on the TURNER?

A. I believe there were two for each boiler, four boilers, eight blowers.

Q. And what was the purpose of a forced draft blower?

A. To burn the black oil to generate heat, generate steam.

Q. And how high would temperatures get on the forced draft blower, if you know?

A. I don't recollect.

Q. What would happen if you touched it hand to bare metal?

A. I don't remember the temperatures.

Page 390

Q. Okay. Do you remember whether or not they were insulated?

A. They were insulated or parts or connections were. And I'm unclear to the details of those.

Q. Was it necessary over the three years you were on the TURNER to supervise or be involved in the maintenance or repair of any of these four Westinghouse forced draft blowers?

A. Eight blowers.

Q. Eight blowers?

A. Two to each boiler.

Q. Two to each boiler. Okay.

A. And, yes, we repaired them.

Q. And would that have exposed you to asbestos, to your knowledge?

A. The insulation portion of the removals, yes.

Q. Okay. And did that make dust?

A. Yes.

Q. Did you breathe it?

A. Yes. I —

Q. With regard to forced draft blower

Page 391

turbines, what's a forced draft blower turbine?

A. A turbine powers the blower.

Q. Okay. But would it be fair to say that the forced draft blower turbine is attached to the forced draft blower?

A. The turbine is the power source to turn the wheel, the blower wheel.

Q. Okay. And, again, is the turbine — so the turbine is part of the blower. So there were eight of them on the TURNER at that time —

A. Yes.

Q. — from Westinghouse?

MR. KATNER: Objection to form, but —

MR. REICH: Okay, I'll re-ask that.

BY MR. REICH:

Q. How many, how many forced draft blower turbines were there on the TURNER from Westinghouse?

A. Eight.

Q. Okay.

Page 392

A. Yes, eight.

Q. And would it be necessary to maintain those eight blowers and turbines?

A. Yes.

Q. And would the maintenance require handling or disturbing any of the insulation that was on it?

A. Insulation on the turbine on the steam end on the — yes, on the —

Q. And how frequently would that occur among the eight?

A. Several of the blowers were relatively trouble free and only required routine maintenance. Several blowers seemed to be very temperamental and require frequent maintenance.

Q. What's a main condenser circulating pump?

A. You mean condensate pump?

Q. I'm sorry?

A. You mean condensate pump?

Q. Condensate or condensate pump, yes, I do, either pump or turbine, pump connected with that.

Page 393

A. Yeah. This is a case where you had a turbine powering a pump moving water from the condenser, moving hot water.

Q. How many of those were on the TURNER from Westinghouse?

MR. KATTNER: Wait. Objection to form, asked and answered about motors.

MR. REICH: I'll re-ask it.

BY MR. REICH:

Q. How many of these circulating pump turbines were on the TURNER from Westinghouse?

A. That is in Exhibit 2. I need to either look at Exhibit 2 or —

Q. You don't recall off the top of your head?

A. Right.

Q. What's the purpose of that devise?

A. The condensate pump takes water from the condenser.

Q. And what does it do with it?

A. Delivers it back into the system to make steam.

Q. Would each of the boilers require that piece of equipment?

Page 394

A. It's required to get the water that's been condensed in the condenser back into this closed loop system.

Q. And would that piece of equipment require maintenance or repair while you were on the TURNER?

MR. KATTNER: Continuing objection. I don't see anything in these records suggesting that there's any pump supplied by Westinghouse. We may have turbines. We may have helical gears. We may have motors, but I don't see anything from a pump from Westinghouse or GE. So unless you have —

MR. REICH: Nobody is saying that those documents are complete. It's what we have for now. If there are other documents that will turn up as a result of a search at the archives, then, you know, they'll be evidence or they won't be, whatever it turns out. But I can certainly ask him from his recollection to tell us —

MR. KATTNER: Well, to extent my client may not have manufactured

* * *

Page 396

about the main condenser circulating pump turbines.

MR. KATTNER: Okay. That's a different thing.

MR. REICh: Okay.

MR. KATTNER: I thought you were asking about the pumps.

MR. REICH: Okay. I'm talking about the pump turbines right now.

THE WITNESS: The turbine.

BY MR. REICH:

Q. Right. And how many of those do you recall — you don't recall how many of those there were.

A. Well, I guess there were four.

Q. Is that an estimate?

A. That is an estimate.

Q. Okay. That's fine. And was there required to be maintenance or repair work on these pump turbines or turbines connected to those pumps, to your knowledge?

MR. KATTNER: Objection to form.

WITNESS: I view the pump

turbine combination as the piece of equipment that requires maintenance. So whether it be the pump end or the turbine end or turbine motor end, whatever, I view the unit — view this as a unit.

BY MR. REICH:

Q. Okay. And was that unit insulated?

MR. KATTNER: Object to form.

THE WITNESS: Turbines were insulated, the pump when it handling a hot media, insulated, yes.

BY MR. REICH:

Q. Okay. And was it necessary to disturb or remove any of the insulation on the Westinghouse turbines that were attached to those pumps?

A. In most cases it would have to have been.

Q. Did that make dust?

A. Any time you remove insulation, or at least in my experience on the TURNER, any time insulation was disturbed you got dust.

Q. And did you breathe that dust?

A. And if you were close to it and

unfortunately I knew no better I was close to it all the time either instructing somebody or looking, inspecting for myself.

Q. So specifically when removing or handling the insulation on the Westinghouse turbines attached to these pumps did that give off dust that you breathed?

A. Removal of insulation on the pump turbine would give of — did give off dust and I would have breathed it.

Q. Okay. Were there any warning labels on any of the General Electric equipment as to the dangers of asbestos?

MR. KATTNER: Objection to form.

THE WITNESS: None.

BY MR. REICH:

Q. Were there any warning labels on the Westinghouse equipment on the TURNER with regards to the dangers of asbestos?

A. None.

MR. REICH: You may Redirect if you choose.

* * *

REPORT OF MATERIAL INSPECTION
OF
U.S.S. TURNER (DDR 834)
HELD
16 MAY 1957
COMMANDER DESTROYER SQUADRON FOURTEEN
MISSION BY COMMANDER DESTROYER DIVISION ONE HUNDRED FORTY TWO
AND U.S.S. KENNETH D. BAILEY (DDR 713)
AT
TARANTO, ITALY

* * *

III – GENERAL COMMENT

1. The U.S.S. TURNER (DDR 834) is a destroyer of the Gearing (692–711) class, 390 feet, 6 inches overall lengyh, 40'10" beam, 3460 ton full load displacement, twin screw, 60,000 SHP, geared turbine drive. The vessel was built by the Bath Iron Works, Bath Maine, and was first commissioned 12 June 1945. The last docking was 12 September 1955 in the Philadelphia Naval Shipyard.

2. a. Chronological summary of activities of the vessel since last overhaul:

MONTH AND YEAR	EMPLOYMENT AND AREA
APR 54 – JUN 55	Shipyard Overhaul, Philadelphia, Pa.
JUN 55 – JUL 55	ISL and Updeep, Newport, Rhode Island
JUL 55 – AUG 55	Refresher Training, Guantanamo Bay Cuba
SEP 55 – OCT 55	Type Training and Upkeep; restricted availability Boston Naval Shipyard for repair of Sonar Dome.
NOV 55 – FEB 56	Operations with U.S. SIXTH Fleet
MAR 56 – MAY 56	Type Training and Upkeep, Newport, Rhode Island
JUN 56 – JUL 56	Midshipman Cruise, Northern Europe and Carribean Area.
AUG 56 – OCT 56	Type Training and Upkeep, Newport, Rhode Island
NOV 56 – DEC 56	Carrier Operations, Atlantic
DEC 56 – JAN 57	Type Training and Upkeep, Newport, Rhode Island
JAN 57 – MAY 57	Operations with U.S. SIXTH Fleet

b. Periods of inactivation, immobility or non-naval service:

Date last tender availability: 18 – 25 April 1957

Number of days vessel underway since last overhaul: 680

Number of days vessel not underway since last overhaul: 135

Marine miles steamed since last shipyard overhaul: 87,627

c. Prospective date of next regular overhaul: 19 September 1957 at Boston Naval Shipyard.

3. a. Date of last InSurv Inspection: 22 March 1955

b. Serious damage or derangement since last Insurv Inspection:

(1) The feed water was contaminated with oil on 7 August 1956

(2) The tubes were out in number one boiler on 28 April 1956

c. Status and Fleet assignment of vessel: Active – Atlantic Fleet [illegible]

* * *

VI – MACHINERY INSTALLATION

1. GENERAL

GENERAL COMMENT

a. The machinery and boilers of the USS TURNER were, in gene [text cut off in original] in satisfactory condition. Logs and records were well maintained and up to date. However, the

Machinery Histor [text cut off in original] and CSMP were not up to date. The material condition and appearance of the engine-rooms and the firerooms was in an unsatisfactory state.

MAIN ENGINES

b. The main engines consist of two 30,000 SHP, LP and HP tur manufactured by the General Electric Co. Each HP and LP turbine is connected through a double reduction gear in a propeller shaft. In addition, there are two cruising turbines installed. These cruising turbines are forward and connected to the HP turbines through a single reduction gear. The latest DESLANT Machinery Inspection Report of December 1956 shows the turbines to be in good condition. Inspection of the latest bearing and thrust readings revealed no indication of an unsatisfactory condition of the turbines. All readings are within tolerance.

REDUCTION GEARS

c. The main reduction gears consist of two (2) sets of Delav [text cut off in original] Co. double helical, double reduction gears. The DESLANT Machinery Inspection Report of December 1956 show gear teeth of #1 main reduction gear to have slight pitting.

LUBRICATION

d. Results of the chemical analysis of the lubricating oil taken March 1957 by the USS EVERGLADES (AD 24)

indicated oil to be in satisfactory condition for continued use.

SHAFTING AND PROPELLERS

e. Vessel last drydocked 9 September 1955. Results of last underwater hull inspection taken 20 March 1957; 2' of the port bilge keel and 10' of the starboard bilge keel were off because of being rolled back. No. 2 spring bearing, starboard shaft stuffing box leaks oil evidently from fuel oil tank B-9¼-F.

MAIN CONDENSERS

f. The main condensers consist of two (2) single pass conden [text cut off in original] manufactured by the Foster-Wheeler Corp. The condensers in good condition.

CONDENSERS AUXILIARY

g. There are two (2) double pass auxiliary condensers manufa [text cut off in original] by the Worthington Corp. The auxiliary condensers are in satisfactory condition.

PUMPS

h. The various pumps were inspected and found to be in a satisfactory condition with the following exceptions:

(1) No. 1 and No. 2 Fire and Flushing pumps experiencing difficulty with bearings and wearing rings. The foun [text cut off in original] of both pumps were heavility corroded and rusted.

RECOMMEND

(a) SHIPALT DD991D – Replacement of Fire and Flushing Pump be accomplished and foundations be replaced.

(2) No. 1 Evaporator Brine Pump foundations were heavily corroded and rusted.

RECOMMEND (a) Replacement of pump foundation.

(a) No. 3 Main Feed Pump shaft sleeves heavily scored.

RECOMMEND (a) Renewal of shaft sleeves.

PIPING, VALES AND FITTINGS i. The piping valves and fittings are, in general, in satisfactory condition. The piping in the bilges, including the HP and LP drains and the Bilge and Ballast System are in poor condition. Pipe hangers and braces in the bilges are corroded and rusted.

RECOMMEND (1) Replacement of pipe hangers and braces. Replacement of HP drain system with heavier piping and replacement of sectic [text cut off in original] LP drain and Bilge and Ballast System which have not been renewed by tenders.

LAGGING j. Lagging in both firerooms and enginerooms is in unsatisfactory condition.

RECOMMEND (1) Renewal of approximately 75% of lagging by Naval Shipyard.

EVAPORATORS k. There are two (2) Griscom Russel Co., low pressure units; one 4000 GPD and one 12000 GPD unit. No. 1 evaporator was inspect [text cut off in original] and found to be in good condition. There was no scale present

RECOMMEND (1) Acid bath at the next shipyard availability.

D.A. FEED TANKS

1. There are two (2) deaerating feed tanks manufactured by the Elliot Co. No. 1 D.A. tank was inspected and found to be in fa [text cut off in original] condition. Slight trace of oil with approximately ¼ pound mud balls was found near the suction strainer. The oil deflectors in the main engines have been renewed since the last previous opening and cleaning of the No. 1 D.A. tank. No trace of oil found anywhere else in the feed water system, therefore, presu [text cut off in original] oil is carried over from the last time oil experienced in syst [text cut off in original]

BOILERS

m. There are four (4) Babcock and Wilcox 3 drum, express type, divided furnace, single uptake, superheat controlled boilers installed operating at a pressure of 600 psi at 850F. There a [text cut off in original] two boilers in each fireroom. The steaming hours since last cleaning as of 24 March 1957:

BOILER	FIRESIDES	WATERSIDES
1	194.5	644.9
2	120.7	120.7
3	0.0	579.5
4	209.7	736.0

Inspection of No. 4 boiler revealed the following defects:

(1) Excessive slag on deck both on saturated and superheat [text cut off in original]

(2) Plastic front cracked on both sides.

(3) Back walls and slopes spalling on both sides.

(4) Studded tubes on both sides required patching with chr [text cut off in original]

(5) Bailey feed water regulator inoperative. Does not hold water level and is not completely connected.

(6) Drain holes plugged. Leakage of fuel oil from burners into air casing occurs.

(7) Boiler requires better preservation underneath.

(8) Superheater inspection plates and exonomizer not opened [text cut off in original] inspection.

(9) All main steam hanger springs in poor state of preserve due to rusting.

RECOMMEND

(a) Installation boiler compound injector tank both fir [text cut off in original] Complete rebricking No. 4 boiler.

UPTAKES AND SMOKEPIPES

n. The uptakes and smokepipes were in unsatisfactory condition due to heavy accumulation of dirt and dust. DESLANT Class [text cut off in original] Item

DD111 – the installation of coaming around the forced draft intakes has been 50% completed.

RECOMMEND (1) SHIFALT DD1098 – modify air intake louvre for forward smoke stack be accomplished.

FORCED DRAFT BLOWERS c. There are eight Westinghouse electric turbine driven propel forces draft blowers. The blowers, in general, are in good condition. The counterweight on the flaps on No. 6 blower not balanced and will not close the flaps.

RECOMMEND (1) SHIPALT 1047K – Modification to lube oil system be accomplished.

FUEL APPARATUS p. The fuel apparatus, in general, was in satisfactory condition [text cut off in original]

REFRIGERATION UNIT q. There are two Carrier Model 7H5 freon 12, 2 ton capacity ea [text cut off in original] refrigerating units. Units were found to be on a satisfact [text cut off in original] condition. However, there was a scale on the condenser whi [text cut off in original] the ship's force is unable to clean because of lack of equi [text cut off in original]

RECOMMEND (1) Shipyard clean scale from the condensers.

INSTRUMENTS MECHANICAL MEASURING r. The instruments were, in general, in satisfactory condition. Numerous gauges required calibration and several gauge glass [text cut off in original] were broken.

REPAIR EQUIPMENT LIFTING JACK	s.	Repair equipment and lifting jack appears to be adequate and in satisfactory condition.

* * *

NO. 90-23333

	§	IN THE DISTRICT
	§	COURT OF HARRIS
IN RE: ASBESTOS	§	COUNTY, TEXAS
CASES	§	
	§	MASTER
	§	ASBESTOS FILE

DEFENDANT WESTINGHOUSE ELECTRIC CORPORATION'S ANSWERS AND OBJECTIONS TO PLAINTIFFS' INTERROGATORIES AND REQUEST FOR PRODUCTION TO DEFENDANTS

Defendant, Westinghouse Electric Corporation ("Westinghouse") hereby responds to Plaintiffs' Interrogatories and Request for Production to Defendants as follows:

PRELIMINARY STATEMENT AND GENERAL OBJECTION

The information sought in these interrogatories and requests for production has been provided to plaintiffs many times previously. Some of these matters have been the subject of numerous depositions. Also, plaintiffs' counsel have reviewed hundreds of thousands of pages of Westinghouse documents previously produced, as evidenced by the inclusion of Westinghouse documents in plaintiffs' Master Exhibit List. Therefore, Westinghouse objects to these discovery requests as redundant, overly broad, and intended only to harass and waste the resources of Westinghouse. Westinghouse respects the fact that

these discovery requests are in a form which has been used in asbestos cases against defendants whose primary business was the manufacture of asbestos thermal insulation. For the reasons set forth below, Westinghouse respectfully submits that this discovery, as applied to Westinghouse, is unduly burdensome and would require Westinghouse to invest massive financial and manpower resources which far outweigh the likelihood that this effort would lead to the discovery of admissible evidence. Westinghouse

* * *

s. identify any warning labels, inserts or other writings provided with such product and with every such printed warning; state what period of time it has or had accompanied the product, the exact wording of the warning, any amendments made to the wording, where the warning was located on each product or packaging, and on what asbestos products the warning appear(ed);

t. geographic distribution range of each such product.

RESPONSE: See Preliminary Statement and General Objection. Westinghouse objects to responding to this Interrogatory for any products not alleged to have contributed to the injuries of plaintiffs on the grounds that it is overly broad and unduly burdensome and seeks information which is irrelevant and immaterial to these proceedings and which is not reasonably calculated to lead to the discovery of relevant, material or admissible evidence. Westinghouse further objects that this Interrogatory

is overly broad, burdensome and harassing. Subject to and without waiving these and the foregoing General Objection, Westinghouse responds as follows:

Because of the unlimited scope of this Interrogatory, the number of years Westinghouse has been in business, the size of its operations, and the way its divisions have customarily retained and stored records, much of the information sought by this Interrogatory cannot be provided. Historically, Westinghouse has manufactured and sold equipment and components for the generation, transmission, use and control of electricity. Since its founding in the 1800's, Westinghouse has sold many thousands of different products, with hundreds of thousands of variations of those products.

Westinghouse did not mine, manufacture or sell asbestos fiber. Where Westinghouse incorporated asbestos into a product it was used as the best commercially available material to satisfy a particular need incidental to the end product being manufactured. Consequently, it was not routinely done.

Based upon good faith information and belief, the following is a list of the types of products sold by Westinghouse which at some point in time may have contained some amount of asbestos. No attempt is made to distinguish between these products as to the type or amount of the asbestos fibers into the air. In many instances, these "products" are themselves components in other end-products. Further, only certain variations of these products contained asbestos during certain periods; many other variations contained no asbestos.

air conditioners and compressors
armatures
brakes for motors, bridge hoists, cranes and other industrial equipment and linings
bus ways
circuit breakers
condensers
control rod drive mechanisms
control items such as relays, contactors, arc chutes overhead controls, and switches
CPL arrester
CRC test press
DC contractor
electronic tubes
elevators
escalators
fans
flexible laminate
floodlights, aviation lights and light fixtures
fluorescent lights
gaskets in equipment
generators
governors
heat transfer products
heating coils
high voltage incandescent lamp, 230V
induction heating equipment and systems
JF autostarter
lighting arrestors
liquid slip regulator
mercury lamp
mercury vapor rectifier
micarta
molded line traps

molded parts for electrical equipment, including:
spacer barrier
mounting or terminal blocks
electrical insulator sleeve
plug board
barrier support
coil shield
motors (split phase, traction, D.C.-fractional horse, capacitors, single phase) and internal insulating materials
moveable building wall panels
network protectors
oxygen analyzer probe assembly
oxygen shield
power reclosures
pumps
range timer
reactor components
redactor gears
sleeving
SVS arrester
steam & gas turbines and ancillary insulation
switchgears
tape
thermal demand meter
toasters
transducers
transformers
valves
varnish treated paper
welding electrodes
welding machines

wire wound resistor assembly

Upon information and belief, Westinghouse distributed, through Westinghouse Electric Supply Company (WESCO), a Westinghouse division, numerous products, manufactured by Westinghouse and other companies, some of which contained asbestos at some points in time. The following is a list of asbestos-containing products of other companies that were available for sale through WESCO.

American Beauty Heater Cord
Armored Thermostat Cable
Asbestos Insulated Heat-resisting Fixture Cord, Type AF
Asbestos Insulated Wire and Cable
Asbestos Ranger and Rheostat Wire "Rockbestos"
Collyer Asbestos Heater Cord
General Cable Asbestos Insulted Fixture Wire
General Cable Asbestos Insulated Flexible Cord
Heater Cord Type HPO
Rockbestos Asbestos Varnished Cambric Wire Types ABC and AVP
Rockbestos Asbestos-covered Nickel Cord
Rockbestos AVC Boiler Room Wire and Cable
Rockbestos AVC Switchboard Wire
Rockbestos Heat Resisting Fixture Wire
Rockbestos Power Cable
Rockbestos Stove Wire
Rockbestos Table LH Hotbed or Industrial Heating Cable
Thermostat Cable

* * *

A. That is correct.

Q. How are you presently employed?

A. I am presently employed with Westinghouse.

Q. And what is your title and your position?

A. I am Design Verification Manager.

Q. Where do you work?

A. I work in Sunnyvale, Westinghouse Electric Marine Division, Post Office Box 3499 at Sunnyvale, California, and the zip is 94088.

Q. How long have you been Design and Verification Manager in that location?

A. Seven years.

Q. And prior to that time, what did you do prior to that time?

A. You know, it is easier if I go —

Q. Forward in time?

A. Forward in time.

Q. Let's do that then.

A I know I had problems last time.

I started with Westinghouse in 1953 as a design engineer. I held that position until 1964, and I went to Sunnyvale, that's as a Senior Design Engineer. In 1967 I became a supervisor of turbines. In 1971 I was Nuclear Products Manager. In 1976 I was Supervisory Engineer on turbines. And then 1980 I became Advisory Engineer, and

then in 1985 I became Design Verification Manager.

Q. At some point in time did you begin to become involved with marine turbines as opposed to land-base turbines?

MR. BROWN: Let me object to the form of the question. I don't think he has ever testified he has been involved with land-base turbines.

MR. WATERS: Q. Have you been involved with land-base turbines or marine turbines throughout your career?

A. I have only been involved with marine turbines.

Q. 1953 to '64, where were you working?

A. Lester, Pennsylvania.

Q. Is that a manufacturing facility?

A. Yes, it is.

Q. Did they manufacture marine turbines at that facility?

A. Yes, they did.

Q. Do you know, have they continued to manufacture marine turbines at that facility?

MR. BROWN: Let me object to the form of the question, continued since what time period?

MR. WATERS: Since he began working in 1953.

THE WITNESS: In 1964 the marine division was transferred to Sunnyvale.

* * *

Page 30

A. No.

Q. Just to clarify, is your response that you did not know, or is your response that no, Westinghouse never recommended any materials?

A. No, Westinghouse never recommended any such materials.

Q. And what is your knowledge based on in that regard?

A. The naval architect is responsible to cover the turbines and the other piping insulation in the engine room so that personnel will not be burned.

Q. And is that the case today, that responsibility of the naval architect?

A. Yes.

Q. And was that the case in 1953?

A. Yes.

Q. Do you have any knowledge as to what was the situation from 1910 to 1953?

A. No

Q. Does Westinghouse provide written materials to its customers with respect to the operation and maintenance and installation of Westinghouse marine turbines?

A. Yes.

Q. Do those written materials make any reference to

Page 31

the use of thermal insulation on the materials —

A. Yes.

Q. — turbines?

A. Yes.

Q. And do those references, or do those comments or whatever, suggest that any type of — particular type or composition of thermal insulation be used?

A. No.

Q. Is it your testimony that those written materials would merely state insulation, these parts should be insulated, or something to that effect?

A. That is correct.

Q. Have you reviewed any such written materials in order to facilitate your understanding of that?

A. No.

Q. Is that just something you know from general knowledge?

A. Yes.

Q. Are you aware that with respect to land-based turbines, Westinghouse provides specifications suggesting what particular types of insulation should be used on the turbine?

A. No.

Q. Does Westinghouse retain any instruction materials or manuals with respect to installation or

* * *

Page 47

gaskets for the moment, was there any other use of asbestos with respect to manufacturing or constructing Westinghouse marine turbines?

A. No.

Q. With respect to gaskets or asbestos containing gaskets used in the manufacture of Westinghouse marine turbines?

A. Yes.

Q. And where would the gaskets be used?

A. Mainly on steamlines.

Q. Did Westinghouse manufacture its own gaskets, asbestos-containing gaskets, or did it purchase them from someone else?

A. It purchased the gaskets.

Q. Do you know where it purchased its asbestos-containing gaskets?

A. No.

Q. Did Westinghouse instructions for the marine turbines call for asbestos-containing gaskets to be used as replacement parts?

A. Yes.

Q. And in your experience, Mr. Gate, about how frequently would it be necessary to replace gaskets that were used on steamlines?

A. Only during overhaul or inspection.

* * *

Warren Steam Pump Company, Inc. Warren, Mass.

Date Nov. 15, 1940 — 74757

Bought of Westinghouse Elec. & Mfg. Co. 150 Broadway, New York City

Purchase Order No. A-15320-1-2-3-4-5-6-7 S.O. No. F.O.B.

Ship Via — Terms

Fed. Ship., Cont. NOd-1433, DD445-8, DD464-6

Beth. Iron Cont. NOd-1434, Destroyers DD449-51, DD467-9

Beth.Steel Cont. NOd-1435, Destroyers DD470-71

Fed. Ship. Cont. NOd-1503, Destroyers DD498-502

Beth. Iron Works Cont. NO-1506 – Destroyers DD507-517

Seattle-Tacoma Shipbldg. Co. Cont. Nod 511, DD554-68

Beth. Steel Cont. NO-1507, Destroyers DD518-525

Beth. Steel Cont. NO-1508, Destroyers DD526-543

Beth. Steel Cont. NO-1509, Destroyers DD544-549

Material on this order comes under the cognizance of the Bureau of ships. USN.

154– (2 per vessel) Westinghouse vertical geared steam turbines for driving Main Condenser Circulating pumps.
Price.....$1,039,500.00

77– (1 per vessel) sets of turbine spare parts.
Price.....$146,300.00

77– (1 per vessel) sets of tools, including two (2) of special wrenches.
Price.....$15,400.00

1– Set type D finished plans
Price.....$240.00

Additional sets of type D finished plans shall be furnished at $160.00 per set.

Such Copies of material for instruction books as required by Subsection S1-1. Price included in turbine price above.

Prices are F.O.B. South Philadelphia, Pennsylvania with transportation allowed to Warren, Mass.

Terms: Net 90 days.

Total net weight, each turbine	3000 lbs.
Total net weight of each set of spares	750"
Total net weight of each set of tools and wrenches	200"
Estimated weight of Navy boxing	250"

Schedule of shipping requirements to be given later. One shipment to start April 1, 1941.

These turbines are to be substantially duplicates of those being furnished for Cruisers CL51. 54 on our purchase order 57530. Slight modifications may be necessary in order to incorporate these units into the machinery design of the above vessels.

Fifteen (15) copies of type B detail drawings to be submitted prior to December 1st, 1940.

These turbines are to be designed to operate with steam pressure at turbine throttle 575 lbs./sq.in, gage saturated and 15 lbs./sq.in., gage back pressure. When operating with the above designed conditions,

turbines are to develop 305 BHP at 865 RPM of the gear shaft, with a guaranteed steam consumption of 33.1 lbs./BHP/Hr. and to develop 138 BHP at 580 RPM with a steam consumption of 49.5 lbs./BHP/Hr.

NOTE: Turbines to be suitable for a steam drum pressure of 665 lbs./sq.in. gage saturated. Working steam drum pressure shall not exceed 600 lbs./sq.in. gage. Turbines glands shall be designed for a 35 lb. sq.in. gage back pressure notwithstanding the fact that the working back pressure will be 15 lbs./sq.in gage. Turbines shall also be capable under emergency conditions of carrying the normal rated load when exhausting against a back pressure of 20 lbs./sq.in. gage, other conditions being normal. Relief valves shall be set at 25 lbs./sq.in. gage.

These turbines will all be of the same rotation but steam and exhaust connections are to be located so as to suit the requirements of installation on these vessels.

In general, these turbo gear sets are to be designed for variable speed operation and equipped with speed limiting governors (without overspeed trip).

The turbines will be of the impulse, re-entry type. A single disc rotor having one row of blades will be overhung from a pinion shaft. The turbine rotor will be a steel forging mounted on the end of a steel shaft which also forms the pinion. The blades will be of corrosion resisting steel set in a groove in the rotor and fastened by pins. The gear will be double helical spur type hobbed on a forge steel rim. The gear case will be of steel construction and will contain the oil reservoir in the base. The gear shaft will extend vertically down to connect to the pump shaft by means of a rigid

coupling. These units shall be arranged with suitable spigot for mounting with the pump and the gear shaft will be required to carry a pump thrust in a downward direction of 5500 lbs. including the weight of the pump rotor. Lubricating oil will be supplied by an impeller on the bottom of the pinion shaft taking suction direct from the oil reservoir in the base of the gear cusp. The lubricating oil system to be complete with cooler, filter, pressure gauge, oil level gauge, thermometer, and necessary piping. In order for the unit to line up properly, it will be necessary for the center of the shaft to be in the center of the counterbore circle with a tolerance of .004" and the finished face of the gear case shall be at exact right angles to the turbine gear shaft with a tolerance of .002".

The following fittings are to be furnished with each turbine:

1 speed limiting governor (mechanical type)

1 turbine exhaust relief valve, nominal size. equal to nominal size of steam inlet

1 steam strainer

1 lubricating oil pressure gage

1 lubricating oil thermometer

1 lubricating oil cooler

1 lubricating oil strainer

1 lubricating oil level gage.
Necessary drain connections and drain valves

Insulation shall be furnished and installed by the shipbuilder after installation of the units in the vessel. Insulation and lagging shall be shown on the type B drawings in accordance in Subsection 539-1 of the General Specifications of Machinery.

All connections shall be extended a sufficient distance beyond the lagging to allow for the completion of the connection aboard the ship without disturbing the insulation or the lagging.

Each set of spares to consist of the following items and shall be in accordance with the General Specifications for Machinery, Section [illegible]

2 sets of ball bearings

1 set of sleeve bearings

1 set of nozzle blocks

1 set of reversing chambers

1 set of governor wearing parts

2 oil cooler cores

2 oil strainer baskets

* * *

For shipyard use

PURCHASE ORDER NO.
DATE

BATH IRON WORKS CORPORATION
BY
GIBBS AND COX, INC.
21 WEST STREET,
NEW YORK, N.Y.

DATE
August 15, 1938
NO. DD423 & 424
43034
Page 1 of 6

material requisition

1. PROPOSED TO BE PURCHASED FROM
Westington Electric & Mfg. Co.

Date of Quotation 7/14/38; 7/11/38; 6/27/38

Delivery Spec. in Quo. 31 wk

2. Material for Destroyers DD423 & 424 Bath Iron Works Corporation

3. Material under Cognizance of Bureau of Engineering .....

4.

Job No.	Item No.	Quantity	Description	Approx. Shipping Weight	Guaranteed Finished Weight
		for two vessels	MAIN FORCED DRAFT BLOWERS		
			Note: Quantities Listed are for two vessels		
	1	16	Main Forced Draft Blowers, horizontal propeller		2587 lbs each.

		type, direct connected steam turbine driven, each complete with attachments and fittings as listed in Appendix B	
2	8	Sets blower controls, each set to control speed of one pair of blowers by single handwheel.	122 lbs per set
3	2	Sets of spare parts for the above units	740 lbs per set
4	4	Sets of tools and special wrenches for the above units	234 lbs per set
5	2	Navy Boxing for Item 3	325 lbs per ship approx.

5. Remarks:

MANUFACTURE: Westinghouse Electric & Mfg. Co., Essington, PA

DD 423 and 424
Approved as
Requisition Only By
Inspector of Machinery
AUGUST 30, 1938

BATH IRON WORKS
CORPORATION
BY GIBBS AND COX, INC.

H. L. Culpepper

IMPORTANT: READ APPENDIX "A"

* * *

APPENDIX B

SPECIFICATION FOR MAIN FORCED DRAFT BLOWERS

(a) GENERAL SPECIFICATIONS: Main forced draft blowers are to be in accordance with Bureau of Engineering General Specifications for Machinery, as listed in Item 8, page 2, and as approved.

(b) SPECIAL SPECIFICATIONS: Main forced draft blowers are to be in accordance with the requirements of Special Specifications for Propelling Machinery for U.S. Destroyers DD423&424 and DD429to436, inclusive, as follows:

"S53-1. FORCED DRAFT FLOWERS (Dated May 1, 1934)"

"There shall be eight identical main turbine-driven Class C forced-draft blowers, two installed for each boiler. Each blower shall be supplied with outside air through a suction truck from the deck. The blowers shall be connected to and shall discharge through automatic balanced shutters or dampers and suitable ducts, to the pressure space between the inner and outer boiler casing. Positive air closure will be required so that each blower of a pair operating on the

same boiler can be used independently of the other. Provision shall be made for drawing air into the main blower intakes from the upper part of the firerooms.

The sound characteristics, volume and pitch, of the blower units shall be a minimum consistent with capacity, pressure, and space factors. Sound-insulated inlet ducts shall be furnished as specified in the detail hull specifications. The arrangement and insulation shall be satisfactory to the Bureau of Engineering.

The Bureau will give consideration to the substitution of Class A (propeller type) blowers for Class C blowers during the development of the contract providing satisfactory sound insulation shall have been developed for this type of blower."

"S50. AUXILIARY TURBINES – All auxiliary turbines, except those driving the turbo-generators, shall be designed to give normal rated capacity at 590 pounds per sq. in. gage saturated-steam pressure at the throttle when exhausting against a back pressure of 15 pounds."

"S50-1. HORIZONTAL TURBINES, GENERAL AUXILIARY (Dated 1 Feb. 1934)." "Sizes of steam and exhaust connections shall be as approved when the final design is submitted of the system in which the turbines are to be installed."

(c) TYPE: Class A, Horizontal Propeller, direct connected steam turbine driven.

(d) CHANGEABILITY: All similar parts of blower units and spare parts must be absolutely interchangeable, so that any part may be interchanged with a similar part without any machining or fitting.

(e) COMPARTMENTS: Main forced draft blowers to be installed in two main compartments per ship.

* * *

SPECIFICATIONS FOR
APPENDIX B

MAIN FORCED DRAFT BLOWERS (Continued)

Note: In the event that the total steam consumption at anyone or more of the nine capacities listed in the vendors guarantee exceeds the total steam consumption listed above for that particular capacity, the vendor will pay the purchaser or allow a deduction to be made from the purchase price, not as a penalty but as liquidated damages at rates in accordance with the following schedule:

Condition A, $14.30; Condition B, $7.75; Condition C, $3.00; Condition D, $1.25; Condition E, $1.05; Condition F, $0.40; Condition G, $0.30; Condition H and I, none; per pound of excess steam consumption for such excess team consumption or the vendor will be required to make replacements to effect the steam consumption specified at the purchaser's option.

(k) FITTINGS: Main forced draft blowers to be furnished complete and including with each unit:

One (1) master nozzle control valve

One (1) steam strainer

One (1) set drain valves as required

One (1) speed limiting governor

One (1) oil pressure or tachometer gage.

One (1) thermometer for lub. oil reservoir temperature

One (1) oil level gauge for lub. oil reservoir

One (1) revolution indicator

One (1) lubricating oil strainer

One (1) turbine casing relief valve, nominal size equal to nominal size of turbines steam inlet.

One (1) set lifting eyes, on all parts as required.

One (1) oil cooler.

One (1) vibrating reed hand tachometer

Control Gear: There shall be furnished with each pair of blowers –

Five (5) Single mitre gears complete including stub shaft, pins and collars.

One (1) Triple mitre gear complete including stub shaft, pins and collars.

One (1) Indicator, bracket and handwheel complete.

Two (2) Stuffing boxes complete.

All other required fittings and attachments will be furnished by the purchaser, including turbine heat insulation and layering.

(l) SPARE PARTS: Spare parts are to be furnished for each ship in accordance with requirements of Bureau of Engineering General Specifications for Machinery, Subsections S53-1, S50-11 and S31-1 and as approved. The spare part are to be listed on these plans. After approval of Type B plans, the approved list of spare parts will be incorporated as a supplement to this requisition. Size, number and content of the spare part boxes shall be identical for the two vessels.

1. DECLARATION OF BARRY L. CASTLEMAN

I, Barry L. Castleman, declare the following under penalty of perjury:

1. I live at 4406 Oxford Rd., Garrett Park, Maryland, 20896. My education consists of a Bachelor's Degree in Chemical Engineering from Johns Hopkins University 1968. I have a Master's Degree in Environmental Engineering, which was mainly in areas related to air pollution control from Johns Hopkins University, 1972. I have a Doctor of Science Degree in Health Policy from Johns Hopkins School of Hygiene and Public Health, 1985.

2. My professional experience goes back over 30 years in the area of asbestos and other occupational and environmental health problems. My field is occupational and environmental health policy, which is a branch of Public Health, mainly oriented towards the recognition of risk factors and the prevention of disease from industrial activities.

3. The Doctoral degree was awarded for two years of course work, various examinations, and the writing of a doctoral dissertation. The course work was mainly in the areas of toxicology, epidemiology, biostatistics, physiology, and public health policy. These are the tools that are used to understand how the body works and can be damaged by toxic substances, how these effects can be identified by means of various studies of people, studies of animals experimentally exposed and so on.

4. My Doctoral thesis was, Asbestos: An Historical Case Study of Corporate Response to an Industrial Health Hazard, and is largely identical to a book published in 1984 by Prentice Hall. Law and Business

call *Asbestos: Medical and Legal Aspects* (now in its 5th Edition, 2005). The doctoral thesis is an historical review of the asbestos problem as a public health problem in society worldwide, but mainly in the United States. It encompasses a comprehensive review of medical literature of all kinds, as well as other literature available in libraries and published sources such as government publications, safety magazines, engineering journals, trade magazines, insurance publications, encyclopedias, popular magazines, and newspapers. The doctoral thesis also involved research based on unpublished government records. The government records included workers' compensation claims files where claims had been made by individuals alleging that they had asbestos-related diseases of the lungs, claims against various companies that were their employers, some of which companies were also manufacturers of asbestos insulation products these individuals has used in the course of their work.

5. In addition to published information of all kinds, I examined files, unpublished information available from the U.S. government archives, the archives of scientists and the archives of institutions that had worked for and with asbestos companies. I also looked at unpublished information which was obtained in legal discovery. This included trade association minutes, corporate documents, and testimony of corporate officials who were associated with asbestos hazards over the years – doctors, plant managers, executives, and other people who were aware of events that transpired.

6. In addition to published information and corporate knowledge that came out of mainly legal

discovery, I have also interviewed many elder statesmen in the field of industrial medicine and hygiene. They included physicians who were active in the field of occupational medicine, such as Harold Stewart, who first published on asbestosis in 1931, and Alfred Angrist, who first published on asbestos and lung cancer in 1942. They are both pathologists. Another, Dr. Wilhelm Hueper, was a leading United States authority in the field of occupational cancer and first director of the environmental cancer section of the National Cancer Institute. Dr. Irving J. Selikoff was the leading epidemiologist and asbestos authority in the US. Dr. Hueper, Dr. Harriet Hardy, Dr. Thomas Mancuso, Dr. Gerrit Schepera, Dr. Richard Doll, Dr. Morris Greenberg, and others I have interviewed were involved in the area of asbestos and health over the past decades.

7. My textbook *Asbestos: Medical and Legal Aspects* (5th ed.) contains a section on 38 companies and/or industry groups that were involved with the manufacture, sale or use of asbestos-containing materials. I have reviewed industry documents and testimony regarding all of these entities as well as may additional companies involved in the asbestos industry. I have never seen any document that discusses or suggests that the United States military prohibited any manufacturer or Seller from warning about asbestos or that the United States military interfered, in any way, with a company's decision regarding whether to issue such warnings.

8. I have also studied and written about the historical uses of asbestos warnings on products and in product manuals. Once companies began to issue asbestos warnings to product users, there is no

evidence that the United States military required the removal or alteration of such warnings for products sold to the military. In 1964, Johns-Manville ("J-M") was among the first companies to provide warnings with its asbestos-containing products, namely its asbestos insulation. During and after this time frame, J-M sold asbestos insulation to the United States military. In any extensive review of J-M documents, which have included visits to the J-M archives in Denver, Colorado, I have never seen any evidence that J-M removed or altered the warning labels that appeared on its asbestos insulation for sales to the United States military. Nor have I seen any evidence that the United States military ever requested that J-M or any other company do so.

I declare under penalty of perjury that the foregoing is true and correct.

July 18, 2008.

s/ Barry L. Castleman
Barry L. Castleman

HENRY HARTZ

* * *

Page 10

A. I finished high school in Trenton, New Jersey. I went on to college at Lehigh University in Bethlehem, Pennsylvania. I left with my graduating class. I did not graduate in 1959. I was employed at that time by DeLaval, as I stated earlier, and I left there for military service in February of 1960. I was discharged in 1964 and went back to work for DeLaval. So I retained my employment rights there.

Q. Okay.

A. And I worked for them since, 44 years.

Q. When you started at Lehigh, what was your major or —

A. Mechanical engineering.

Q And for the benefit of the ladies and gentlemen of the jury, can you tell us what a mechanical engineer, what sort of things do y'all study in college?

A. Interesting question. All engineering-related courses relative to products mechanical engineers would study. It could be automotive, could be structural, which is usually civil, but things of that nature.

Q. Did you have at that time a direction that you wanted to — how you wanted to use your ME degree?

A. At that time, no. My intent was basically to finish. And actually what I ended up doing is I finalized my education while I was working for DeLaval.

* * *

Page 84

was not something we provided with the pump at that time. You don't want the emergency packing in the pump if the seal is functioning properly.

Q. Can you tell us what packing is, what we're talking about?

A. Packing — the packing that I'm familiar with was generally a stack of what are called rings, packing rings that were alternate hard and soft rings. So you had five rings of packing that made up a set. The outer ring on both ends was a hard ring, which is like a wire mesh or some sort of a mesh type thing, and the inner the center ring was also this hard thing, and it was the soft rings that were in the middle that probably: that contained some of the asbestos fibers in the structure of the packing.

Q. Okay. And up until what year was the packing used routinely in the pumps?

A. Like I said, when I started in 1964, my recollection was mechanical seals, so I don't know when we stopped prior to that.

Q. Okay. And at that time in '64, were there some types of pumps or uses for pumps where packing was still preferred over mechanical seals?

A. Yes, there were some.

Q. Okay. And what were those?

Page 85

A. Those were in applications where you had heavy fuel or Bunker C oil, Number 6 oil. You were pumping a heavy viscose fluid. Mechanical seals were not good that type of application.

Q. Okay. Have mechanical seals in the design and engineering of those caught up now where mechanical seals can be used for all applications?

A. To my knowledge, they have been, yes.

MR. RUNYAN: Okay. The videographer needs to change the tape, so why don't we — I guess we can break for lunch now, if y'all want to, to get a jump on the crowd. We can go off the record.

VIDEOGRAPHER: We're off the record at 11:35 a.m.

(Recess from 11:35 a.m. to 12:43 p.m.)

VIDEOGRAPHER: We're on the record at 12:43 p.m.

Q. Sir, are you ready to continue?

A. Yes, I am.

Q. Great. And again, any time you need to take a break, just let us know and we will be happy to do so.

We had left off talking a little bit, gotten into the asbestos products or component parts that DeLaval may have used in their pumps. And we had talked about packing a little bit, and then I think where we just

left off, we were talking about mechanical seals having replaced packing.

A. Right.

Q. With respect to the packing, you had said, I believe, that there are some uses even after you were there where there were — packing was still better than mechanical seals, and then now the engineering

has caught up where mechanical seals can be used in almost all applications?

A. That's correct.

Q. With respect to the packing that was used, do you know when the last time was that any asbestos would have been contained in the packing with respect to the DeLaval pumps?

A. I believe that occurred in early '70s.

Q. And what do you base that belief upon?

A. When the notice became pretty widespread throughout the country, I guess, asbestos was definitely a potential problem.

Q. So you believe the early '70s was the last time any packing that contained asbestos would have been used?

A. That's my understanding.

Q. I think you have touched on it, but in case you haven't, can you tell me in the best laymen's terms that

* * *

Page 90

as part of their maintenance schedule is to go in and replace the packing in the pumps, or how would they — when would they come in?

A. Seals or packing?

Q. I'm sorry, packing.

A. Packing. They may set up a procedure where they had fixed maintenance schedules, but I think over the course of time, the Navy has learned that if it's still working, don't mess with it, in laymen terms.

Q. Okay.

A. In other words, if it's — you know, if you're not having a problem with it, even though it's a fixed maintenance time for other equipment or you have access to it and if you're not having trouble with that, leave it alone, as long as it's functioning properly and the system works properly.

Q. Did DeLaval ever give recommendations with respect to the maintenance schedule or replacement schedule that should be used for the packing?

A. Not to my knowledge .

Q. Where would we find that if they did?

A. If it's in some of the old tech manuals, that might be available.

Q. And were tech manuals — was that — I'm assuming that's an abbreviation for technical manuals?

Page 91

A. That's correct. Sorry.

Q. Were they being supplied as what the ladies and gentlemen of the jury might refer to as a users manual type?

A. Yes.

Q. Okay. And that would be supplied with every pump?

A. In general on commercial, yes, you would get a technical manual, standard technical manual with every pump, that's correct.

Q. Let's discuss a little bit now the gaskets that may have been used with respect to the DeLaval pumps. How were gaskets utilized in their pumps?

A. Their face seals where end covers comes together with a pump case where you're going to seal so that the product stays within the pump itself. In general, depending on the application, you will use plant fiber.

Q. And for the benefit of the ladies and gentlemen of the jury, can you describe what a gasket is and why it is used in your best laymen's terms, please?

A. If you don't use a gasket, if you have two metal surfaces that come up face to face, typically it's uncommon to have them perfectly flat. If you had them perfectly flat, you could probably eliminate the gasket. But because of operating temperatures, changes in

temperature when you go from an ambient condition to a normal operating condition, which is typically elevated temperatures above ambient, it causes for expansion of components and parts. So you can have separation at the faces. The gaskets allow you to get past that point as a link path. They prevent the leakage from occurring.

When you install the units, you bolt them up with a predetermined torque so that during operation conditions they won't leak during normal operating conditions.

Q. How did DeLaval determine what the gasket material should have been made out of?

A. It's generally dictated by the application and basically the least expensive component to buy that would be available and still serve the job.

Q. And why would they have used one material over another? Is there any particular reason?

A. Temperature — a high temperature application could cause you to get into asbestos, which is better resistant against heat.

Q. And would any part of your job duties have concerned the use of one gasket over another?

A. As far as my job duties are concerned, no. That was predetermined by engineering.

Q. Okay. Who would know more about those actual

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Page 48

Q I'm going to ask you to turn to page 33 of that deposition.

A I thought you would.

Q Yes. And I'm going to have you read line 7 through line 14 .

A Okay.

"Q What did Mr. Bouchard tell you about his experiences?

"A I don't have an answer for that. I just don't remember that he had any specific comments relative to that. He just — he just said that there was an ongoing study or an ongoing evaluation or seeking of information to determine how asbestos may have been used in our products.

Q And you can stop there.

A All right.

Q So — strike that.

And you've never looked at specific documents regarding DeLaval's use of asbestos; you just have a general knowledge regarding Delaval's use of asbestos in their products, correct?

A That's correct.

Q Other than the asbestos gaskets and asbestos packing used on some of the equipment, isn't it also true

Page 49

that some of the customers at DeLaval would apply asbestos to the DeLaval equipment after they received

it?

A Are you talking about pumps?

Q I'm talking about any DeLaval equipment?

A It's my understanding that turbine division made provisions for asbestos blankets, that's my understanding, which was applied by the shipyard.

Q And DeLaval knew that that was going to occur. In other words, that the shipyard would apply that asbestos insulation on the outside of their DeLaval equipment?

A Yes, sir.

Q Do you have an idea of organizations or the technical societies in which DeLaval has been a member?

A Specifically, no. I'm sure there's a lot of them, though, because they've been around for a long time and they've been associated with the Navy for a long time when they were in business.

Q Is it your opinion that DeLaval is involved in most of the major technical societies?

A I would hazard a guess to that, yes.

Q Is it your opinion that they've been member of the American Petroleum Institute for a long time?

A I suspect that they have been.

Q Do you know if DeLaval was a member of the American Petroleum Institute when you began with the

* * *

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Page 110

MR. REICH: Objection. You can answer.

THE WITNESS: Yes.

BY MR. STOKES:

Q. Is it your understanding that any material or product that went aboard the USS TURNER was determined by the U.S. Navy?

MR. REICH: Object. Go ahead. You can answer

THE WITNESS: Yes.

BY MR. STOKES:

Q. And that the U.S. Navy specified the use of any materials used aboard that ship; is that right?

A. Specified and procured.

Q. And nothing could go aboard that ship without the allowance of the U.S. Navy; is that right?

A. Yes.

Q. Were you ever present aboard the ship when it underwent any overhauls?

A. Yes.

Q. And it's my understanding when a ship undergoes overhauls it goes into a shipyard;

* * *

would be helpful if we go over them now then later when your attorney might ask about it.

So with that in mind, was there a particular type of motor that you all used generally unless spec'd out differently or did you all use whatever the customer spec'd out?

A. The answer is, in essence, all of the above. It could be what the customer required. It could be just a particular motor manufacturer that we were using at the time that could have easily switched to somebody else. There is no one good reason. I mean the customer might have had a specific requirement on the motor that only this certain manufacturer could comply with, so we had to go that way, so it's no one particular reason.

Q. Would your answer be the same as regards closed coupled pumps?

A. Yes.

Q. Okay. So, I guess sort of just in summary to sort of help me understand better, if I understand your testimony correctly, what motor was used could depend on a number of factors, including what the customer requested, what the customer

needed, what the customer had and what you all may have been using at the time depending on other factors?

A. Well —

MR. SHAFFER: Object. Let me object as to form. With respect to any particular order or as the types of orders they fill?

MR. BULLOCK: Just generally. Yeah. Just generally.

MR. SHAFFER: Okay. Subject to that clarification, you can answer.

THE WITNESS: The only thing I would add to that, or what the manufacturers could actually supply to us.

BY MR. BULLOCK:

Q. Gotcha.

Now, as I understand it, centrifugal pumps or let me — let me keep them broken down so that we're being — being specific. On a closed coupled system, when a pump is completed by Buffalo Pumps and is prepared to be shipped to the end user, to the customer who's purchasing it, is the pump always shipped assembled, completely assembled?

A. Yes, it is.

Q. Okay. At the time that it is shipped in a closed coupled system, how many different gaskets would have been installed on that particular pump?

A. It depended if it was a packed pump or – or you're talking gaskets?

Q. Gaskets only.

A. Well, it still depended if it was a packed pump or a mechanical sealed pump.

Q. Okay. In a — in a packed pump, how many would it have?

A. One.

Q. Now, that's true for all closed coupled packed pumps, centrifugal pumps, between 1950 and 1992, to best of your knowledge?

A. To the best of my knowledge, yes.

Q. Okay. If it was a mechanical seal, closed coupled pump, how many gaskets would it have on it?

A. Two.

Q. Now, as to a closed coupled packing pump that has one gasket, where would that gasket

be?

A. It would be between the casing cover and casing joint.

Q. Okay. As to mechanical seal pump that had two gaskets, where would gasketing be?

A. Well, the first one again would be between the casing cover and casing joint. The second one would be at the mechanical seal gland and the casing.

Q. Now, other than a specific request or – or let me preface it this way: Between 1950 and 1992, other than a specific request from a customer to use a gasket that did not contain asbestos — let me back that up.

Was there a period of time between 1950 and 1992 that other than a request from a customer not to use

asbestos-containing material that asbestos-containing gaskets were used in the manufacture of closed coupled pumps?

MR. SHAFFER: I'll object to the form of that question.

BY MR. BULLOCK:

Q. Do you understand the question?

A. No, I do not.

Q. Okay. During the period 1950 to 1992, was asbestos gasketing used in closed coupled pumps that were manufactured by Buffalo Pumps?

A. Yes, they were, pursuant to specifications and other information that was supplied to us by customers.

Q. Is your testimony that it was only placed there as a requirement of specifications of customers?

A. No, it is not.

Q. Okay. If a customer did not specify – let me – let me try to keep this as clean as possible.

I understand at some point Buffalo Pumps stopped putting asbestos gasketing in their pumps unless specifically requested by a customer, is that correct?

A. There was one instance of that.

Q. Okay. But there was a point at which Buffalo Pumps on their own stopped using asbestos gasketing subject to a request from a customer?

MR. SHAFFER: Objection to the form.

Page 79

Misstates – assumes facts not in evidence, misstates the testimony. You can answer.

THE WITNESS: No. Buffalo Pumps – and this is from what all these documents show you here – began the change-out of asbestos gaskets and packing in the early 1980s.

BY MR. BULLOCK:

Q. Okay.

A. It was not a specific customer request or anything like that.

Q. Yeah. Okay. I'm not — that's not what I was trying to get at. What I'm trying to say is there was a point at which asbestos gasketing was being used and then there was a point at which it was not being used, correct?

A. That is correct.

Q. Okay. Do you recall the year or the year range in which asbestos gasketing was phased out by Buffalo Pumps on closed coupled pumps?

A. Well, this would, also, hold true to double suction, so I don't –

Q. Okay. Good. All right.

A. But it began – in the early '80s is

Page 80

when we began to phase – or the change-out.

Q. Do you recall when at what point the change-out would have been completed?

A. It was around 1985. And that reason it took to that time was because of the United States Navy.

They wouldn't allow us to replace some of the asbestos gaskets and packing that we wanted to use.

Q. Was the decision to stop using asbestos gasketing made at the same time as the decision to stop using asbestos packing?

A. The decision to start the change-out was in that same time period, yes.

Q. Okay. Now, other than product for the U.S. Navy, was there a period of time earlier than 1985 at which you had competed for non-Naval requests of pumps?

A. It was during that same time period. I don't remember the specific date.

Q. Other than Naval specifications that required asbestos gasketing and/or asbestos-packing, were there any other considerations that caused the period of time to be so long?

MR. SHAFFER: Objection to the form.

MR. BULLOCK: If you understand the question, please answer it.

MR. SHAFFER: Object to the characterization.

THE WITNESS: Yes. There were not direct replacements for the gasket. The industry – the packing and the gasketing manufactures had not given us suitable replacements for that. And then it took a few years for them to come up with those replacements.

BY MR. BULLOCK:

Q. So the persons providing – the companies providing the gasketing material for you were

responding to a request from Buffalo Pumps to change the material?

A. That was part of it. It was becoming, less available, and they were in the process of changing –

Q. Excuse me.

A. – of coming up with those replacements.

Q. Do you know whether Buffalo Pumps

* * *

AFFIDAVIT

Arthur Faherty being duly sworn upon his oath deposes and says:

1. I have been employed for many years in the fields of U.S. Navy equipment, and in the applications of U.S. Navy requirements under .military specifications, usually referred to as mil specs and issuances of the Secretary of the Navy and his designees and assignees and subordinates.

2. A copy of my CV is attached hereto and incorporated herein by reference as Exhibit A.

3. I am acquainted with the records and documents and deposition testimony concerning Plaintiff's exposure to asbestos in the Navy as well as the affidavits and/or reports of Dr. Betts and Admirals Lehman and Sargent and Captains .Lowell and Moore and David Hobson and. the letter of Drinker on which removal was based.

4. I have considerable experience in the interpretation of military and Navy documents.

5. I am aware of the Navy specification for the equipment for World War II era ships and later, known as general specification for Machinery Sub S 1-1 page 2.

6. These specifications required warnings and safety precautions.

7. I am aware of the Specifications for Shipyard Contracts.

8. The 1936 specifications required taking of precautions and warnings.

9. I am familiar with MIL-M-15071D which was the military specification and its predecessors including 15071A-C and the specifications referenced in paragraph 5 of that document, MIL-M-15071A-D

are roughly the same and involve similar requirements.

10. 15071 states that the intent of the Navy was to accept the usual commercial manual when roughly equivalent to the overall requirements of the Navy.

11. Mil Spec 15071-D was later succeeded by MIL-15071E.

12. 15071D requires submission of the manual to the Bureau of Ships which would then adopt the manual as a Navy document.

13. 15071D requires manuals to contain safety precautions (section 3.1.9.).

14. 15071D requires that all manuals must contain notes, cautions and warnings to emphasize critical instructions. (Section 3.3.6)

15. included was the definition of the term "warning" which is defined by the Navy as operating procedures and practices which will result in personal injury or loss of life if not correctly followed. (Section 3.3.6 (c))

16. 15071D section 3.1.7 requires instructions to include precautions.

17. I am also familiar with Department of Navy Sec Nav 62603.5 later Sec. NAV 5700.5 dates 1956.

18. This document is also known as Uniform. Labeling Program for Hazardous Industrial Chemicals and Materials, hereafter Uniform Labeling Program and was in place when the Plaintiff entered the Navy.

19. The Uniform Labeling Program was designed to standardize labeling requirements for hazardous products and provide labels to contain pertinent information to warn users of potential dangers.

20. The Uniform Labeling Program applied to Labeling of all hazardous materials throughout the Navy.

21. The Uniform Labeling Program was not designed to govern the type of warning labels.

22. The Navy stated that the type of labels were to be governed by state and federal laws and regulations.

23. The Uniform Labeling Program noted that development of new products makes it mandatory that precautions should be taken including warning labels. (Section 3).

24. For poisons, a skull and cross bones was to be affixed.

25. Poison is defined as a substance with an inherent property that tends to destroy life or impair health. Asbestos is essentially a poison.

26. Paragraph LC of enclosure (3) defines a Class III toxic hazard as any industrial or military material which may be give off a. harmful, vapor, dust, fume or mist during handling or operation. The injuries effect may arise front one exposure (acute) or repeated exposures over a prolonged period (chronic). The mode of entry into the body maybe by ingestion, inhalation or absorption through the skins.

27. Paragraph 2.a of the Uniform Labeling Program. refers to the Warning Labeling Guide published by the Manufacturing Chemists Association.

28. This Guide, first published in 1946, requires precautionary labels for harmful dust. The reference to the guide shows the Navy's constant concern for warnings of hazards like asbestos.

29. The only conclusion that can be drawn is that espoused by Captains Lowell and Moore whose

affidavits and essential conclusions I agree with based on my many years of experience with the Navy and ships. These are attached as Exhibit D and E.

30. This conclusion is that by the time Plaintiff began his Navy service on the Chilton the Navy required warnings of the hazards of asbestos in equipment for ships and that all claims that the Navy would have barred or prevented warning labels are untrue.

31. It is clear from these documents that the Navy wanted the warnings to reach Navy personal such as Plaintiff.

32. The Navy required manufacturers not only to warn on the products but to supply manuals containing warnings to each ship and precautions for use of the product

33. Thus, when defendants sold products for use on ships that lacked warnings that met state and federal standards and/or the standards of the Manufacturing Chemists or the American Conference of Government and Industrial Hygienists this was in violation of specific Navy directions and requirements.

34. Rather than barring warnings, the Navy encouraged warnings, and the failure to warn of the hazards of asbestos violates Navy requirements.

35. The failure to include warnings and safety precautions in their manuals of their equipment violates specific Navy requirements,

36. The claim that the Navy would have barred warnings is thus false and without basis.

37. Some of the defense experts suggest that because the Navy manuals contain no warnings the Navy believed asbestos to be safe.

38. The fact that there is no discussion of asbestos hazards in Navy documents suggest the Navy did not know of asbestos hazards.

39. Asbestos was generally required on all high heat applications.

40. In many cases the suppliers of such equipment usually supplied asbestos product with/on/in their equipment.

41. Suppliers of equipment to the Navy were engaged by the Navy to participate in renovation and overhaul of their own equipment, or that of others, including asbestos containing parts in shipyard repairs.

42. Suppliers of equipment frequently supplied replacement asbestos or disturbed previously supplied asbestos as part of their activities on ships.

43. I expect to testify, at trial, on what the Navy archive records show about equipment supplied to the vessel, or vessels at issue and what the records show as individual defendants supplying original or replacement asbestos containing equipment or disturbing asbestos.

44. Generally, if a company supplied asbestos with its equipment, some of that asbestos was always present unless the record shows that the asbestos installed by the defendants was entirely removed.

45. The removal of the entire initial asbestos never occurred.

46. I cannot comment, in this affidavit, as to defendants whose material I have not yet examined, but will supplement my testimony at trial by reliance on the documents from the archives.

47. I am also prepared to discuss the use of asbestos on Navy ships.

/s/ Arthur Faherty
Arthur Faherty

Sworn to and subscribed
Before me this 14th day of
June, 2013

/s/ N.S. BAE
NOTARY PUBLIC
N.S. BAE

IN THE COURT OF COMMON PLEASPHILADELPHIA COUNTY, PENNSYLVANIA

- - -

KENNETH E. McAFEE and SHIRLEY McAFEE, h/w	:	OCTOBER TERM, 2013
vs.	:	
20th CENTURY GLOVE CORPORATION OF TEXAS a/k/a Guard Line, Inc., et al.	:	NO. 205

- - -

THURSDAY, OCTOBER 24, 2013

VOLUME I

- - -

Oral deposition of KENNETH E. McAFEE, was held at Courtyard Glassboro-Rowan University, 325 Rowan Boulevard, Glassboro, New Jersey, commencing at 10:30 a.m., on the above date, before Deborah A. Brazukas, a Registered Professional Reporter, Certified Shorthand Reporter of New Jersey, License No. XI 01938, and Notary Public.

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* * *

Page 34

from — where did you graduate from high school?

A. Fort Worth, Texas.

Q. And what years?

A. 1967.

Q. Okay. Did you go to college right after that?

A. Yes.

Q. Okay. And what — what college did you attend?

A. Tarrant County Community College.

Q. And did you complete any degree?

A. No.

Q. Okay. What was your course work? What were you focusing on?

A. General studies.

Q. General studies, okay. Were you full-time?

A. Yes.

Q. And at some point you entered the U.S. Navy?

A. Yes.

Q. Okay. What year did you enter the U.S. Navy?

Page 35

A. 1969.

Q. So from — from high school, you went to college for a couple years, and then you entered the Navy after that?

A. Yes.

Q. Okay. Were you drafted or did you — did you enlist?

A. Well, I actually had a draft notice, but I enlisted.

Q. Okay. Where did you go for basic training, sir?

A. Orlando, Florida.

Q. And how long was basic training?

A. Eight weeks.

Q. And where — what was your next station — where were you stationed next after basic training?

A. Newport, Rhode Island.

Q. And what were you doing in Newport, Rhode Island?

A. I was aboard a ship.

Q. So you went right from basic right onto — onboard ship?

A. Yes.

Page 36

Q. Okay. And what ship were you assigned to, sir?

A. USS Voge.

Q. V-O-G-E?

A. Yes.

Q. What kind of ship is the USS Voge?

A. At that time, it was classified as a destroyer escort. Classification changed in later years to a fast frigate.

Q. Was — did at this time change while you were on the ship?

A. No.

Q. How long were you aboard the USS Voge?

A. From '69 to '71.

Q. Did you have any specialization aboard ship? What was your — what were your job duties on the ship?

A. At that time, I was a — I went aboard as an E2. And it's basically, ship maintenance.

Q. And what was your title? Were you a bosun?

A. Seaman apprentice at that time.

Q. Okay. So you would have been on — was it about — well, what year or what month did you get onboard ship, if you remember, or what — what time of the year, what season was it?

A. It was in the summer, July, I believe.

Q. July.

How long were you — do you know what month you left the ship?

A. No. I really don't.

Q. Okay. So would it have been about — about two years you were onboard the ship?

A. Just about. Just about.

Q. Okay. When you say you performed ship — were you a — I thought I saw a BM2. Is that a boats —

A. Yes.

Q. — boatswain?

A. Boatswain's mate, yes.

Q. Boatswain's mate?

A. Yeah.

Page 38

Q. Did you have a primary location where you were stationed to perform your duties onboard the ship?

A. No. It was throughout the ship, maintenance throughout the ship.

Q. Okay. So what kind of maintenance were you doing onboard the ship?

A. Painting, chipping paint, repairing rust spots, general cleaning, maintaining the anchor system. We also at that time were standing watches on the bridge, steering the ship at sea, standing lookout watches.

Q. Is this all above deck?

A. Some below deck.

Q. Okay. Where were you below deck?

A. As low as the forward anchor, anchor chain locker, which is the very bottom of the ship, and as far aft as the after steering compartment.

Q. Okay. Did you ever have any duties in any of the engineering spaces aboard the ship?

A. Not at that time.

Page 39

Q. Okay. So in 1969, sir, was there — how often would you be below deck versus up above deck, if you can estimate?

A. Probably half and half.

Q. Do you know the USS Voge, do you know when that — do you know when it was constructed?

A. No, sir.

Q. Do you know if it was used during — was it a World War II ship?

A. No, it was not World War II, I know that.

Q. Okay. Were there — when you were below deck, were there insulation on pipes running through the ship?

A. Yes.

Q. Okay. Did you ever have to work with any of that?

A. No.

Q. Were you ever below deck when the ship was on a training exercise or anything like that?

A. Yes.

Q. Okay. What kind of guns did the

ship have?

A. That ship had five-inch 38s, and ASROC.

Q. I'm not familiar. What's an ASROC?

A. Anti-submarine rockets.

Q. Okay. Thank you.

When those guns were fired, did that — the whole ship shake?

A. Yes.

Q. How about when the ASRAC —

A. ASROC.

Q. — ASROC was fired — sorry. You can tell I never served in the Navy — did that cause any vibrations in the ship?

A. It caused some, but not as much as the guns.

Q. How often were you aboard that ship for that almost two years you were there where you were below deck and the guns were fired?

A. When the guns were fired, I was below deck all of the time, except for when I got reassigned to one of the gun mounts. And

Page 41

the latter part of my career onboard that ship, I was assigned to the forward gun, five inch 38. So I wasn't below deck then. I was on deck in the gun mount.

Q. Okay. So almost the — in the almost two years you spent there, how much time would you have been assigned to the gun mount versus below deck? Was it half and half or —

A. No.

Q. — more below deck?

A. Doing — for the gun mount time, I was only — only probably six months out of the time I was there I was in the gun mount. The rest of the time I was below deck when we fired the guns.

Q. Okay. When — when the guns were fired and you were below deck, that — you'd see dust and that sort of thing come off the ship and off the pipe covering and off the different pieces of equipment that were down below?

A. Yes.

Q. Would you have breathed that

* * *

Page 46

A. Guard.

Q. Guard?

A. Guard.

Q. G —

A. G-U-A-R-D.

Q. Did the tag say anything other than Guard and asbestos?

A. It had the — where it was made. A series of numbers too. I couldn't remember the numbers.

Q. Okay. Fair enough.

How long would a pair of gloves last?

A. I have no idea. I know they lasted the whole time I was aboard.

Q. Okay. Were these gloves dusty at all?

A. Yes.

Q. How — how would you — how would they create dust?

A. You — it would create dust when you put them on, and even when you take them off it would create dust. When you simulate opening a hatch, you had to use those gloves

to open that hatch so you wouldn't get burned. And the minute you touch it, you know, touch that handle and start operating, dust would come off of it.

Q. Okay. Other than possibly the insulation onboard the ship and the gloves, do you believe you had any other exposure to asbestos aboard the USS Voge?

A. Not that I know of.

Q. What was the next ship you were assigned to, sir?

A. I went from the Voge to the USS Davis.

Q. And that was in '71?

A. Uh-huh.

Q. And —

A. Yes.

Q. Sorry.

A. Yes, sir.

Q. And how long were you aboard the Davis?

A. Approximately two years.

Q. So until about '73?

A. Well, actually, it was less than

that. It was actually — I left — I left the Davis in '72.

Q. Okay. And what kind of ship is the USS Davis?

A. It's a destroyer.

Q. And what was your title aboard the USS Davis?

A. I was a BM2 then, boatswain's mate.

Q. Okay. Did you have the same general duties as you had aboard the USS Voge?

A. With the exception of in a supervisory position at that time.

Q. Okay.

A. And was added to — to the job title as a rigger. We did a lot of rigging aboard the ship.

Q. Can I — I'm sorry, Mr. McAfee —

A. McAfee.

Q. — sorry, let me back up a step. I just thought of something about the USS Voge.

While you were aboard the USS

Page 49

Voge — and I'll try and let you know when I'm switching gears — did the ship ever go into dry dock for any overhauls?

A. Not while I was aboard, no.

Q. Okay. Back to the Davis.

A. Okay.

Q. So your duties were similar, except that you were — you're more supervising other younger sailors?

A. Yes.

Q. Okay. So you would have done general cleaning, maintaining the anchor, you stood watch, were steering the ship, all those sorts of duties?

A. Yes.

Q. Again, were most of those above deck?

A. The rigging part —

Q. Well, let me rephrase that. I apologize.

Were at least half of those above deck?

A. Yes.

Q. Okay. I apologize for – go

Page 50

ahead, the rigging part.

A. The rigging part, most of the rigging part was done below deck.

Q. Okay. And what would you be rigging? Like —

A. If the engineers had to work on engines or something, they would — and they had to remove a part, we would have to go in and rig that part out of its position for them to — to repair so they could do the work on them.

Q. Okay. So this would have been in the engineering spaces?

A. Engineering spaces sometimes.

Q. Okay. How much of your work was rigging versus the other work you did?

A. Probably the rigging was probably one third of the — the work. Two-thirds was the other work.

Q. Okay. Is it fair to say that as a BM2, the non-rigging work would have — you would have not been in — if that makes any sense. As a BM2, you would have not been in the engineering spaces other than when you

were performing rigging work?

A. Yes.

Q. Okay. What kinds of equipment did you have to help rig up to — to move?

A. Compressors, pumps, gyros, engines, electronics.

Q. And why would these pieces of equipment need to be moved?

A. If they were doing repairs on them, it depends on what they were taking out, you know. If they had to be separated — if the engine had to be separated from a pump, we had to rig — we had to rig it away

from that — had to rig the pump away from the engine so they could repair it.

Q. Okay. If this — while this work was being done, was the ship underway or was it in port?

A. Sometimes it was underway; sometimes we did it in port. Depends on when it happened. If it happened at sea, while we were at sea, then naturally, we would do it while we were at sea if it had to be done, if

it was something that could not wait until we got back in port.

Q. Okay. So if it was an emergency, you would do it at sea; otherwise —

A. Yes.

Q. Sorry.

A. I'm sorry.

Q. No. It's all right.

— otherwise you would wait until you got back to port to do the repairs?

A. Yes.

Q. Do you — what kind of repairs were done on these pieces of equipment, if you know?

A. Well, I know some of it was repacking impellers; some was pulling the heads off of a diesel engine; replacing gaskets; I know a couple of times, they were replacing pistons.

Q. Okay. And how would it work, sir? Would you go down there, rig the piece of equipment up, have it

moved, and then leave while the repairs were done and then come back and put it back in place?

Page 53

A. It depends on how long it was going to take to do the work. In some cases, we — we stayed because the danger of where — the part that we rigged off, we couldn't stabilize it. We'd have to be there to stay and make sure it didn't get in the way of anybody else.

Q. Okay.

A. And in some cases, we could rig it off and place it in a different place and then we could leave and then come back.

Q. All right. Do you believe any of the work you did as a rigger would have exposed you to any asbestos?

A. Not aboard the Davis.

Q. Okay.

A. In other places, other — other ships it was.

Q. Later in your career?

A. Yes.

Q. Okay. We'll get there.

Okay. The Davis, were you onboard that ship when the guns were fired during exercises?

* * *

Page 58

A. Yes.

Q. And then sweep it up?

A. Yes.

Q. With just a brush and a — with a broom and a — and a dust pan?

A. Yes.

Q. Okay. Was that a dusty process?

A. Yes.

Q. Okay. And were you present when this work was done?

A. Yes.

Q. Okay. And did that happen pretty regularly?

A. Especially in Vietnam, yes.

Q. Okay. And you would have breathed that dust when you were supervising the men?

A. Yes.

Q. How long was the Davis stationed in Vietnam?

A. The ship was actually there until I think it was — I believe March or April of '73. However, I — I got transferred in October of '72.

Page 59

Q. Okay. So you left the Voge around approximately July and you were aboard the Davis in approximately October of '72?

A. I left the Davis.

Q. I'm sorry, right.

And you were aboard in approximately July of '71?

A. Yes.

Q. And it was over there in Vietnam the whole time?

A. Yes.

Q. Okay. Where was the port? What was the home port for the Davis?

A. Newport, Newport, Rhode Island also.

Q. Was — the time you were aboard the Davis, did it undergo any overhauls?

A. We did minor overhauls, but we were not in dry dock.

Q. Okay. Where was that overhaul?

A. In Boston Naval Shipyard.

Q. When you say a minor, what was done to the ship?

A. They reconstructed the – the

superstructure. It was a — the superstructure at one time was — was open. The main deck was open all the way up and down the superstructure. They enclosed part of it all the way down to — from one part of the superstructure all the way down on the main deck up to the 01 level.

Q. Okay.

A. They enclosed all that area, so it was not exposed to the weather like it used to be. They also added the — the five-inch 54 guns and the ASROC and re — and moved the torpedo tubes from the main deck up to the O2 level. So we didn't need to go in dry dock to do that, but they...

Q. Was any work done in the engineering spaces during this minor overhaul?

A. Not that I was involved in.

Q. Okay. Do you know if your — what was your — did you have any role at all while the ship was being overhauled?

A. Yes. We still had to do our normal routine. We still had to maintain all

the parts of the ship that we did. Our maintenance work continued. When it went on, we still had to do that.

Q. Okay. Were you involved in any rigging of any of the equipment during the overhaul, or was that all —

A. That — that was done by shipyard workers at the time.

Q. Okay. So in October of '72, you leave the Davis and you go to the USS Yosemite?

A. Yes.

Q. And what kind of ship is the USS Yosemite?

A. It's a destroyer tender.

Q. And how long were you aboard that ship, sir?

A. Until October '74.

Q. So two full years?

A. Yes.

Q. And where was the home port for the Yosemite?

A. Mayport, Florida.

Q. Was that — was that ship

involved in any combat?

A. No.

Q. Did you have similar duties aboard the Yosemite as you had aboard the Davis?

A. Yes.

Q. Okay. So you were supervising younger sailors?

A. Yes.

Q. Okay. Did they perform the same duties you previously described?

A. Yes.

Q. I'm trying to short circuit it.

Did you work as a rigger aboard the USS Yosemite?

A. Yes.

Q. How much of your time was spent being a rigger versus your other duties?

A. About the same, rigger, about one third.

Q. Okay. Do you believe any of your work as a rigger would have exposed you to any asbestos?

A. Yes.

Page 63

Q. Okay. And can you tell me how?

A. Well, one instance I — I distinctly remember, we were — we were rigging a small generator from its — from its position. And we had to — the beam clamps up, the chain fall rubbed up against some steam piping, and it emitted dust. We believe that it was asbestos.

Q. Okay. Was this below deck?

A. Yes.

Q. Okay. And just so I understand what you're saying, you were removing a generator, a smaller generator?

A. Smaller.

Q. And some of the chaining you used to move the — to rig the generator rubbed up against some steam pipes?

A. Yes.

Q. Did that just brush up against it, or did it knock the insulation off?

A. It actually rubbed a slot right in.

Q. Oh, okay.

A. Yes. And it ripped — ripped

Page 64

part of the lagging, opened it up.

Q. Okay.

A. To where it emitted dust.

Q. Okay. And how big an area were you in when this happened?

A. It was actually a large area. It wasn't confined, the space — the part of the engine — we were in the after part of the engine room, where we were.

Q. Were you — how close were you to the lagging when it ripped open and the dust was emitted?

A. It was right above us.

Q. Okay.

A. Right above us.

Q. Did you have to clean up that pipe covering?

A. Yes.

Q. And, sir, when I say you, I mean did your crews have to clean that up while you were present?

A. Yes.

Q. I'm sorry. I should be more specific.

Page 65

Did they use the — did your crews use foxtails and dust pans?

A. Yes.

Q. And that made dust?

A. Yes.

Q. And you were present?

A. Yes.

Q. And you would breathe that dust?

A. Yes.

Q. All right. Do you know who made the pipe covering? Do you remember any names of any of the manufacturers of any of the pipe covering onboard any of the ships you served on?

A. No, sir, I don't.

Q. Okay. Other than that one instance involving the pipe covering while you were rigging that small generator, do you believe any other time you were working as a rigger you were exposed to any asbestos?

A. Not aboard the Yosemite.

MR. PRESENT: Okay. Can we take a short break now for a little bit?

MR. ADAMS: Sure.

* * *

on your crew?

A. Sixteen.

Q. In October of '74, you moved to a different ship?

A. No. I went to recruiting duty.

Q. Oh, okay.

A. And left ashore. I was onshore.

Q. And how long were you involved in the recruiting duty in Philadelphia?

A. Three years.

Q. So until approximately '77?

A. Yes.

Q. Do you know what month you ended the recruiting duties?

A. Must have been October.

Q. Okay.

A. Of '77.

Q. Okay. And were you living on — in base housing at the time you were doing recruiting?

A. Part of the time I was. And — well, when I met my wife, we moved out of base housing to Clayton.

Q. Okay. And we already talked

about Clayton, I think.

A. Right.

Q. All right. Do you believe you had any exposure to asbestos while you were performing your duties as a recruiter from October of '74 through October of '77?

A. No.

Q. And then were you reassigned to a new ship in October of '77?

A. No. We went — I went to Guantanamo Bay, Cuba.

Q. And what were you doing in Guantanamo Bay, Cuba?

A. I was a tug master.

Q. And what's a tug master?

A. The skipper of a tugboat.

Q. Did you have any training for that?

A. Yes.

Q. Okay. Where did you do that training?

A. In Guantanamo Bay, Cuba.

Q. Okay. Was it basically on-the-job training?

A. Yes.

Q. Okay. How long were you assigned as a tug master at Guantanamo Bay?

A. The full-time I was there, from '77 to '80.

Q. Do you know what month in 1980?

A. I know I left in October of '80.

Q. Okay. So was it three full years?

A. Yes.

Q. And what were your duties as a tug master?

A. Well, I was responsible for assisting the training — the ships that came down for training. That's a training base. When they came down for training, assisting them to and from the docks and

maintaining that tugboat was my main thing. I had a crew of eight people. And we had to do it all.

Q. Okay. Let me back up a step, so I understand. The tugboat basically helps the ships get into port and out of port?

A. Yes.

Q. Okay. So that's what you meant

by assisting in —

A. Right.

Q. All right. And it was you and eight people aboard the ship?

A. Yes.

Q. What kind of — you said you had to maintain the ship?

A. Yes.

Q. Okay. What kind of work did you have to do on the tugboat?

A. Rigging. We had to actually help repair engines or any — any component that went down aboard that tug, we had to do it ourselves.

Q. Okay.

A. It was just eight people, one engineer. And so we all had to do the work to do that. We also had to do the regular cleanups, the regular maintenance of the — of the rust or anything that broke, any engine parts that broke, any repairs to the engines, to the generators, to the pumps, to the brakes. We had to do it all.

Q. Okay. Do you believe any of your

work exposed you to any asbestos?

A. Yes.

Q. Okay. And how so, sir?

A. Well, when we — as I was explaining before, we had to do all of the work.

Q. Okay.

A. The engineer — we were under the guidance of the engineer that was there. But he explained to us and showed us how to do things. For instance, repacking the impeller that was leaking from a freshwater pump. We had to — we had to take the old packing out, put new packing in. The brakes on the shaft, it had air — air brakes on that shaft. On the tugboat, when you stop the engine, you don't want it to keep turning, you don't want the propellers to keep turning. So it's equipped with an air brake. Air brakes have to engage, and we have to work — make sure those brakes work all the time. So we had to replace the brakes. One time we replaced a piston. We replaced generators, air compressors. The air compressors are the

ones that would fill up the bags for the brakes and ran the horn on the ship. We had to — we had to do all of that work ourselves.

Q. Okay. Let me take them one at a time. Okay?

A. Okay. Sure.

Q. And I'll ask you about each one.

When you say repacking the impeller, was that the drive shaft for the ship, or is that for a pump or —

A. That's for — for a freshwater pump.

Q. Okay. And what was the freshwater feeding into?

A. Fresh — into supply on that — on that ship.

Q. For drinking water?

A. Yes.

Q. Okay.

A. For drinking water.

Q. So it was for potable water?

A. Yes.

Q. Okay. And how often do you have

to repack that impeller? Was it a one-time occasion, or did it happen more than once?

A. It happened more than once.

Q. Okay. How many times?

A. Not on the same freshwater pump, but probably during the three years, I probably replaced packing in that thing probably five times, you know, different — different ones. We had two freshwater pumps onboard. So it wasn't the same one that went down all the time.

Q. Okay. Were those pumps ever replaced or was it the same two pumps the entire time?

A. Same two pumps. We didn't replace the pumps.

Q. So out of both — in taking into consideration both pumps, you changed the packing five times total?

A. Approximately five times.

Q. Approximately five times. Fair enough.

And — and this is for drinking water?

Page 81

A. Yes.

Q. So it's room temperature, or is it chilled or — the water?

A. It's — they did have a chilling factory on there, but it didn't always work and we didn't care about that.

Q. Sure.

A. We just wanted to make sure we had water pumping to the water fountains where we could get water.

Q. All right. So this isn't a high heat or — application?

A. Not high heat, but it was — it was hot, yes.

Q. What was hot?

A. The — you mean the water that's coming through that you mean?

Q. Yes.

A. Because — yes. Yes. It's from — we have a potable tank onboard.

Q. Okay.

A. And that's where the water was, in this tank. And the pump pumped the water from that tank to reservoirs for — for us.

* * *

Page 122

A. No.

Q. Do you know who made the gasket that was put back on?

A. No.

Q. Okay. I think we talked about all the ways that you initially told me you believe you worked on the tugboat that would have exposed you to asbestos. Is there any other way you can think of working on that tugboat that would have exposed you to asbestos that we haven't already spoken about?

A. No.

Q. How — I mean, you were — were you the captain of the tugboat?

A. Yes.

Q. Okay. And I mean, how often would you need to do repair — any kind of repairs? I mean, was that something that happened daily, or was that something that happened once a week or —

A. It happened an awful lot in the three years. That's all I can say. It happened a lot. It was always something

going down on that bottom. As I — as I explained before, this was — this was a — this was a training base. Every morning, 6 o'clock in the morning, 15, 16, 17 ships get underway. So you have to get them out to sea. And then they'd come back again at 6 o'clock at night, we'd get them back in. So those boats get a lot of workout. And things happen, and you have to keep them up or else the ships don't move.

Q. Okay. Fair enough.

A. Sometimes we work all night long sometimes just to get these things going.

Q. So it would be ready for —

A. So it would be ready —

Q. — the next day?

A. — the next day.

Q. Okay. Fair enough.

So we left off in October of '80 when you left Guantanamo Bay.

A. Right.

Q. Where were you assigned when you left?

A. When we left Guantanamo, I went

to — let's see. I went to the — to the Butte.

Q. Butte, B-U-T-T-E?

A. Yes.

Q. What kind of ship is the USS Butte?

A. Ammunition ship.

Q. So does that mean it's a ship that would supply other ships in the Navy with ammunition —

A. Yes.

Q. — for their guns?

A. Yes.

Q. Okay. And how long were you aboard the USS Butte?

A. Eighteen months.

Q. So October 1980 through April '82?

A. Yes.

Q. Wait. No. That would be — oh, no, that's —

A. Yeah. Because I left there and I went to Philadelphia Navy shipyard on another tugboat.

Page 125

Q. Okay. So what were your duties aboard the USS Butte?

A. I was in charge of the second division, which was responsible for the rigging of the transfer stations where we would transfer the ammunition.

Q. Okay. So you would be responsible for getting the ammunition rigged up so it could be moved from the ammunition ship to whatever ship you were supplying?

A. Yes.

Q. Did you —

A. Staging it, staging it and the maintenance on the transfer station.

Q. Well, what's a transfer station?

A. It's — it's a lift that would lift up, lift ammunition up, and we send a wire across to the other ship. And the ammunition travels on that wire across to the other ship. There's a control station that — just like a crane operator would operate to hoist it, to send it across, and to bring it back.

Q. What kind of maintenance was

Page 126

required for the area you worked in?

A. We had to maintain the wire. That wire was under a lot of tension, so we had to keep it rust-free. And we had to repair the — maintain the — the lift mechanism. We had to repair, maintain the station where the operator would sit, make sure all the gears worked and everything worked there electronically. And we also had to make sure that the station area

was clear, safety — safety lines were put up, where nobody could — could enter the station while we were in operation.

Q. Okay. Do you believe any of your work aboard the USS Butte in charge of the second division exposed you to any asbestos?

A. I can't say for sure, but I know it had a braking system on it that emitted dust.

Q. Okay. On the — on the —

A. On the tower. The tower had a braking system on there that emitted dust. But I never had to do anything with that, with the — with the repair of that. This

was another ship that had the people to do that, so we didn't have to do it. The only thing I was required to do was rig the station, send the stuff across, and bring it back, and get — get the ammunition staged. But I know that braking system did emit dust. So I don't know what kind of — you know, I can't say for sure.

Q. Okay. And that's fine.

Is this braking system located on the tower that

—

A. Yes, on the tower.

Q. Okay. So it's up above the ship?

A. Right. It runs like a worm gear.

Q. Oh, I see.

A. Up and then it got — when you lift the tower up itself, it slides between an opening like and the tower slides up between there. And when you want to stop it,

it brakes — the brakes move into it to stop the tower at the height that you want it to be.

Q. Okay.

A. You had to put it at different

heights, depending on what kind of ship you were sending to.

Q. I see.

So where were the brakes, were these down close to the deck or were these up, higher up?

A. You had — you had — you had two space. You had one at — two at — you had the brakes at the bottom and you had the brakes at the top, at the top, by the tower. Now, even though — even though you may extend higher, but the braking system stopped at the height of the tower.

Q. Okay. And do you know who made those brakes on that system?

A. No, sir, I don't.

Q. Okay. Even though you didn't have to do the work, were you ever present when anybody else did any repairs to the brakes?

A. No, sir.

Q. Okay. Would the dust be made each time you had to use the brakes?

A. Every time that thing stopped,

dust would emit, yes.

Q. All right. And how many people — you said you were in charge of this — the second division?

A. Second division, yes.

Q. How many people were you in charge of?

A. Thirty-two.

Q. Thirty-two.

And were — all 32 people have some kind of job to perform whenever ammunition was being transferred?

A. Yes. Unless we were only running one station. If we were running two stations, then I needed everybody.

Q. Okay.

A. If we were only running one station, only half of them.

Q. I see. So 16 person —

A. Yes.

Q. Sixteen —

A. Per station.

Q. Per station, right.

All right. Actually, your —

have we — all right. So then other than the brakes, is there anything else that you believe may have exposed you to asbestos aboard the USS Butte?

A. No.

Q. The next ship on this document, which your plaintiff — which your attorney was kind enough to

remind me I had sitting in front of me, was the USS Nitro. Was that the next ship you served on?

A. Right. Right.

Q. It shows from 1986 to 1989 —

A. Uh-huh.

Q. — is that correct?

A. Yes.

Q. So what did you do between 1982 to 1986?

A. I was at the Philadelphia Naval Shipyard.

Q. Okay.

A. Running another tugboat.

Q. Do you remember, in April or May of '82 you left to go back to — sorry, you didn't go back — you went to the

Page 131

Philadelphia Naval Shipyard. What month did you leave in '86? Do you know?

A. I believe it was May.

Q. So you would have been about four full years at — running a tugboat at the Philadelphia Naval Shipyard?

A. Yes.

Q. Were you again a captain?

A. Yes.

Q. Okay. What was the name of the ship?

A. It was YTM-801 Commodore.

MR. MIRABILE: I'm sorry, could the court reporter read that back.

(Whereupon, the court reporter read back the record as requested.)

BY MR. ADAMS:

Q. Was Commodore the name of the ship?

A. Yes.

Q. All right. Did you have duties similar to the duties you described when you were at Guantanamo Bay?

A. Exactly the same.

Page 132

Q. Okay. Did you ever have to replace packing on impellers aboard the Commodore?

A. I don't remember doing that.

Q. Did you ever have to change head gaskets on the compressors aboard the commodore?

A. Yes.

Q. Was it the same process?

A. Yes.

Q. Was it the same — was it the same kind of ship? I mean the dimensions of the head gaskets were the same and everything —

A. Yeah.

Q. — or is it slightly different?

A. The head gaskets were the same, but this is an older — older tugboat than the 820, and a smaller one. This one's — this one was only about 90 foot long; 820 was 110 foot.

Q. Okay. How often — did you personally remove the head gaskets from — from the compressors aboard the Commodore?

Page 133

A. Same as — just like we did on the — on the other one, yes.

Q. Okay. Was this something that happened often or not as frequently as aboard the other tugboat?

A. I was actually there longer than I was the other one. So this one was many times too. There's many times. Because the system — the whole system on this older tug was — was manufactured by the shipyard personnel, because this tug didn't really have all the modern conveniences as 820 had. It was a lot older. So they had to put air brakes on. They had to put the remote throttles on. All that had to be put on. They put the new — new compressors on because of the shaft brake. It didn't — the old one didn't have that. They had to put all that on. So that was all manufactured by the shipyard. And then they turned it over to us to maintain. So we had to maintain.

So the first — first year or so we didn't have a whole lot to do on it other than the regular maintenance. After

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Page 138

where we could avoid stuff like that. The commodore was a lot smaller. And sometimes you couldn't avoid the chain fall rubbing against something.

Q. Okay. When you say chain fall, is that the rigging, the chains used for rigging different equipment?

A. Yes.

Q. Do you know if the pipe covering aboard the Commodore contained asbestos?

A. No, sir.

Q. When was the — when was the tug overhauled that it had all this new stuff added, the air brakes and the remote, if you know?

A. See I — I got there in '86, so — no. I got there in —

Q. '82.

A. — '82. It was — it was in — in dry dock when I got there so —

Q. Okay.

A. — so they were in the process of working on it then.

Q. So it got an overhaul in 1982 at

some point?

A. Some — somewhere around that time.

Q. Okay.

A. I know I took it out for the first test run.

Q. Okay. So we've got the gaskets and then possibly the — the pipe covering. And that's — any other ways you believe you may have been exposed to asbestos aboard the Commodore during the four years you were aboard?

A. No.

Q. I think the last ship we have, sir, is the USS Nitro?

A. Uh-huh.

Q. What kind of ship is that?

A. It's another ammunition ship.

Q. Did you board in — was it May, May of '86?

A. Yes.

Q. Until 1989?

A. Yes.

Q. This document here has April of

Page 140

1989. Is that accurate?

A. Excuse me. Let me — let me back up.

Q. Oh, of course.

A. Because I went to — I went to a school for eight weeks prior to going to the Nitro.

Q. Okay. What kind of school did you go to?

A. Senior enlisted academy, Newport, Rhode Island.

Q. And what were you doing at the senior enlisted academy?

A. Going to school there. It was a —

Q. Sure. I'm sorry. But for — what were you learning? What were you being trained for?

A. Trained — we took — had courses in like defense economics, leadership, public speaking. It was — it was geared to senior enlisted. This is the time when I made senior chief and we had to — you go aboard a ship, you'll be the senior enlisted aboard

Page 141

and you'll be the liaison between the captain and the crew.

Q. Gotcha, all right.

Would you have had more managerial-type responsibilities at that point then?

A. Yes.

Q. Okay. What were you — what — so you were senior chief aboard the USS Nitro?

A. Yes.

Q. Okay. And what — what kind of duties did you have aboard the Nitro?

A. I had — like I say, I was the — I was the senior enlisted aboard. I was the — the go-between between the captain and the crew. I was the morale booster. I was the one to keep the crew in line. I controlled the senior — the professional development board, where young sailors would come before me and my board to -- to make rank. I went — I assisted the XO every day, you know, with habitability.

Q. What's habitability?

A. Habitability as far as cleanliness of the ship.

Q. Okay. Do you believe any of the duties you had aboard the USS Nitro exposed you to any asbestos-containing products?

A. No, I didn't. I was strictly management at that time. I was away from the hands-on work.

MR. ADAMS: All right, sir, I need to take a couple-minute break. Are you okay with that?

THE WITNESS: Yes.

MR. ADAMS: We'll come back.

We're at a good spot to break.

THE WITNESS: Sure.

(Whereupon, a brief recess was taken.)

(Whereupon, Exhibit Nos. McAfee-1, McAfee-2, and McAfee-3 were marked for identification.)

BY MR. ADAMS:

Q. Mr. McAfee, have we now talked about all the ways you believe you were exposed to asbestos while you served in the

Page 143

U.S. Navy?

A. Yes.

Q. And, sir, I assume you were honorably discharged?

A. Yes.

Q. And what — what jobs did you work after you left the Navy? Did you have any jobs?

A. Yes. I worked for B.F. Goodrich. I worked for the U.S. Post Office. I worked for a contractor in the naval shipyard called Global Associates. And I worked for the Department of Veteran Affairs, State of New Jersey.

Q. Okay. Let's take those one at a time, sir.

A. Okay.

Q. Was B.F. Goodrich the first job you held after you left the Navy?

A. Yes.

Q. Okay. And where were you working?

MR. PRESENT: You want the physical location? Is that –

Page 144

MR. ADAMS: Yes, or town.

THE WITNESS: The plant — Pedricktown, New Jersey.

BY MR. ADAMS:

Q. Fredericktown?

A. Pedrick, P-E-D.

MR. PRESENT: It's P-E-D-R-I-C-K-T-O-W-N, right?

THE WITNESS: Yeah.

BY MR. ADAMS:

Q. And what did you do for B.F. Goodrich?

A. I was a laborer.

Q. What was in Pedricktown? What kind of facility?

A. It was a facility that made body side molding for cars.

Q. And how long did you work there as a laborer, approximately?

A. Not very long. I think I worked maybe — maybe — maybe six months at the most.

Q. Okay. Do you believe you were exposed to asbestos working as a laborer at

Page 145

the B.F. Goodrich plant?

DEFENSE COUNSEL: Objection; lack of foundation and personal knowledge.

MR. ADAMS: You can answer, sir.

MR. PRESENT: Don't pay any attention to that.

THE WITNESS: I have no idea.

BY MR. ADAMS:

Q. Mr. McAfee, that objection is to my question, not to you or any answers you may give. Okay?

A. Okay.

Q. And was the next position then you had with the U.S. Post Office?

A. No, I'm sorry. I missed something.

Q. Okay.

A. Kaytron, I worked for a company called Kaytron.

Q. Okay. And what's Kaytron?

A. It's a assembly plant for feeders.

* * *

IN THE COURT OF COMMON PLEAS
PHILADELPHIA COUNTY, PENNSYLVANIA

- - -

KENNETH E. McAFEE	:	OCTOBER TERM,
and	:	2013
SHIRLEY McAFEE, h/w	:	
vs.	:	
20th CENTURY GLOVE CORPORATION OF TEXAS a/k/a Guard Line, Inc., et al.	:	NO. 205

- - -

FRIDAY, OCTOBER 25, 2013
VOLUME II

- - -

Continued oral deposition of KENNETH E. McAFEE, was held at Courtyard Glassboro-Rowan University, 325 Rowan Boulevard, Glassboro, New Jersey, commencing at 10:51 a.m., on the above date, before Deborah A. Brazukas, a Registered Professional Reporter, Certified Shorthand Reporter of New Jersey, License No. XI 01938, and Notary Public.

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Page 223

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KENNETH McAFEE, after having been previously duly sworn, was examined and testified as follows:

- - -

EXAMINATION

- - -

BY MR. HEXSTALL:

Q. Good morning, Mr. McAfee. How are you?

A. Just fine, sir.

Q. Can you hear me okay?

A. Yes.

Q. Okay. Same instructions as yesterday. If there's ever anything, let me know. And if you don't understand a question, just let me know and I'll try to rephrase the question. Okay?

A. Okay.

Q. I want to start off today and ask you some questions about your time in Guantanamo Bay. All right?

A. Okay.

Page 224

Q. Now, you were there from 1977, I think you said, until October of 1980?

A. Yes.

Q. And do you know what month in '77 you started?

MR. PRESENT: No, it's not '37. He wasn't born until 1948. So it couldn't have been 1937.

THE WITNESS: I thought he said '77.

MR. PRESENT: Oh, '77, I'm sorry.

BY MR. HEXSTALL:

Q. Okay. Do you know what month in 1977 you started?

A. I'm not sure, but I think it was May 1977.

Q. And I thought you referred to it as a training base. What type of training was taking place there?

A. That's the fleet training group. That's where they train ships' crews for deploying.

Q. Okay. And did you participate in

that training as well?

A. I did when I was on other ships. But I was not there in the training capacity at the time.

Q. Okay. When you were there for that three-year period, your responsibility was as the skipper for the tugboat?

A. Yes.

Q. Okay. And on that tugboat, there was one engineer, yourself, and eight crew members?

A. Six crew members. Including the two of us —

Q. Six crew members?

A. Yeah, the — including the two of us, the total crew was eight.

Q. Okay. And how many hours per day were you actually on the tugboat?

A. Maybe 12, 13 hours a day.

Q. Okay. And how many days a week?

A. Depending on the training. Sometimes the training went through the weekends. If not during the weekends, it would be like Monday through Friday.

Page 226

Q. And your crew's goal and the engineer was to get the ships in and out of port, correct?

A. Yes.

Q. And in that capacity, what were your specific duties as it related to getting the ships in and out of the port? And I'm not talking about working on equipment here. Just in terms of getting the ships in and out, what did you specifically have to do?

A. I was the master of the tug.

Q. Okay. And in being a master, what were you responsible for doing?

A. Steering and navigating the tug.

Q. Okay. Other than steering and navigating, did you have any other responsibilities in getting the ships in and out of port?

A. Not in getting the ships in and out of port. I supervised the — the rest of the crew.

Q. Okay. And what were the rest of the crew doing?

A. They handle all the deck lines,

Page 227

the lines that we connect to the ships, where they — they handle those when we were in operations.

Q. Okay. And that's basically what you were doing for 12 or 13 hours each day?

A. Negative. We didn't stay — we didn't operate with the ships all day. We took the ships out and then we came back and did our maintenance on the ship, on the tugboat.

Q. Okay. On average, how long would it take for you to bring a ship in, if everything went smoothly?

A. Forty-five minutes to an hour per ship.

Q. Okay. And how long to get a ship out of port?

A. It was less time to get it out of port. Probably about 20 minutes.

Q. Okay. And were there ever times when it took longer to get it out of port?

A. If there was —

Q. Or was that pretty —

A. — if there was other movement

going on at the same time, it slowed us down, because it was not just one ship moving at a time. Sometimes there was three or four ships moving at a time.

Q. Okay. And were there ever occasions where it took longer than 45 minutes to an hour to bring a ship in?

A. Yes.

Q. What would be the — the most amount of time that you can recall that it took to bring a ship in?

A. That's hard to say. I can't — can't really pin that down on how long it would take. Because there was all kinds of things that happened. And — and I

really wasn't timing myself to see how long it would take us to do that. If — if one ship that was ahead of us had problems getting into the port, we had to stand by and hold onto the ship until they clear. So —

Q. Okay.

A. — it could vary.

Q. And in terms of the number of ships, I think you told us yesterday there

were about 16 ships each day that you had to do this for?

A. Sometimes we had as many as 16 ships; not all the time.

Q. What was the average? What was the least amount of ships you would have in a day?

A. The least amount?

Q. Yes.

A. One.

Q. So there were some days where you only had one ship; other days where you had up to 16?

A. Yes.

Q. Okay. In terms of the name of the ship, it's the Wanamassa; is that correct?

A. Yes.

Q. And it's the YTB-820, correct?

A. Yes.

Q. And you were on that same tugboat that entire three-year period?

A. No. I —

Q. What other — what other tugboat

Page 230

were you on during that three-year period in Guatemala — Guantanamo Bay?

A. There was another one that was a YTM, but I don't remember the number on it. I think it was 543, but I can't remember. I was only on that a short period of time.

Q. Okay. About how long were you on there?

A. I don't remember. It was just a short period of time that I was on it. I was on — spent most of my time on the Wanamassa.

Q. Okay. And I'm just trying to get — when you say short period, would that be a week? Would that be a couple weeks? Can you give me an average or estimate?

A. I — it was more than a month, I know that, but I just don't remember how long it was.

Q. Okay. And all you can remember about that — was there a name for that ship or was YTM-543 all you can remember?

A. It was — YTM-543 was — was the hull number.

Q. And there wasn't a name for that

Page 231

tugboat?

A. It probably had a name, but I — I don't remember. I was on it such a short period of time as part of the training to be a tug master. I did the training on that and that's it.

Q. Okay. So that would have been the early part of your time?

A. Yes.

Q. And were you — did you have the same responsibilities on that?

A. No. I was in a training mode. I was there to train.

Q. Going back to the Wanamassa, can you describe — what was the size of that tugboat, the dimensions of it?

A. It was a 440 ton tugboat, 110 foot long, 12 foot shaft — 12 foot screw, stainless steel screw.

Q. And how many different areas were there on the tugboat?

A. (No response.)

Q. Is it easier to give me like a general layout?

A. It's laid out just like a regular ship. You had the berthing area, you had the engineering spaces, you had a galley, you had the captain's quarters, you had the pilot house, you had a chain locker, you had several storage spaces on there, and all kinds of voids. I just don't really know how many spaces there were.

Q. All right. And what was the age of the Wanamassa?

A. I'm sorry, I didn't understand.

Q. How old was that boat?

A. I don't know.

Q. When you boarded it in 1977, was the equipment already in place or were they still installing new equipment?

A. No. Everything was there.

Q. So when you started in '77, the — the two air compressors that you spoke of were already onboard?

A. Yes.

Q. And where exactly on the tugboat were the air compressors located?

A. In engineering space.

Page 233

Q. Were — were both air compressors in that same engineering space?

A. Yes.

Q. And were they next to each other? How far apart were they?

A. Yes, they were. They were right — right next to each other.

Q. And it's my understanding that you were responsible for doing some repairs on the air compressors when they would leak air?

A. No. I was not doing the repairs. I — we assisted because of the short — short amount of people that we had on board. I did most of the rigging and in some cases ripping out packing. Most of the other stuff was done by the engineer. The technical part was done by the engineer.

Q. Okay. So rigging and packing was what you primarily did in terms of repairs?

A. Yes.

Q. But were there occasions when you did work on air compressors?

A. As far as rigging?

Page 234

Q. As far as doing any type of repair.

A. Not repair, rigging, yes.

Q. Okay. And in rigging the air pressures — air compressors, what were your responsibilities?

A. If — if the head had to come off, we – I would rig the head off of it, the — set up chainfalls to take that head off. Or if it had — if it had to move forward to remove a shaft, then I would do that. I would rig it, that part. But the technical part, the technical work was done by the engineer. If there was any packing that had to be pulled out, he would let us do that. And he would reinstall.

Q. Okay. And the air compressors, I think you testified yesterday that they ran the brake and air horn?

A. Yes.

Q. And anything else?

A. Not that I'm aware of.

Q. And in your capacity on this tugboat, you were never specifically trained

Page 235

as an engineer to do the technical work, were you?

A. No.

Q. You would just assist him if he asked you to if you were short staffed or something like that, correct?

A. Yes.

Q. The air compressors, you told me yesterday — or you told us yesterday that they were four feet by two feet?

A. I just estimated. I didn't — I don't know.

Q. Anything that's happened since yesterday that would change that estimate in your mind or is that still fair?

A. Like I said, I'm just — I'm just estimating, just pretty well guessing. I didn't measure them, and I don't know. They wasn't very big, that's for sure.

Q. Okay. Were they portable air compressors or were they stationary?

A. No, they were stationary.

Q. And what was the shape of the air compressors?

A. You — you mean if — if it was round —

Q. Were they oval? Were they square? Can you describe the shape of them?

A. They were like — well, elongated, I guess. It was longer than they were — longer than they were wide.

Q. Okay. But the end of them, were they round at the end? Were they square at the end? Were they rectangular or like an oval?

A. I believe it was like — I'm trying to remember. Probably — it was elongated, so it had to be a little rounded off on the ends.

Q. And what were they made of?

A. Metal.

Q. What color were they?

A. Gray.

Q. And were both of these — so I don't have to ask you the same questions twice, were both of the air compressors identical?

A. Yes.

Page 237

Q. And how were they powered?

A. By diesel engine.

Q. Do you remember whether or not there was any writing on the air compressors?

A. There was — I know there was tags on it. There was a tag on it that said what kind of compressor it was.

Q. Okay. Where was the tag located?

A. At the base, the base of it.

Q. Okay. And what — what did the tag say?

A. Ingersoll Rand, and it had a series of numbers.

Q. Did it say anything else other than Ingersoll Rand?

A. Not that I can recall.

Q. Do you recall any of the model numbers or serial numbers?

A. No, sir.

Q. Other than the tag that said Ingersoll Rand, was there any writing on the air compressor itself?

A. I believe the top of it said Ingersoll Rand too, I believe.

Page 238

Q. Okay. When you say the top of it, where on the top of it did it say Ingersoll Rand?

A. Where the — I guess these were like valves or something, that stuck out of the top of it. I think that's what — some kind of valve was on the top of it. I believe it said Ingersoll Rand somewhere in that vicinity.

Q. Okay. And was the whole word written out?

A. Yes.

Q. Do you remember what color that writing was?

A. The whole — the whole thing was gray, the engine, the whole thing was painted gray.

Q. Okay. The words Ingersoll Rand, though, do you remember what color that writing was?

A. It's — the whole thing was gray, the writing —

Q. The letters were gray as well?

A. Everything was painted gray.

Q. And painted gray by the Navy?

A. Yes.

Q. Did you ever see any packaging for that compressor itself, the entire air compressor?

A. No.

Q. Were you ever responsible for ordering any parts for the air compressor?

A. No.

Q. At any time during that three-year period, was — were either of those air compressors ever removed as far as you know?

A. No.

Q. Other than the — the head gasket that you spoke about, what other components were on that air compressor?

A. I couldn't tell you. I'm — like I said, I'm not an engineer, I don't know these parts on this thing.

Q. Okay. Fair enough.

Did you ever see any manuals or any specifications for the air compressors?

A. I saw the manuals, yes. I saw some of the manuals, yes.

Q. Did you ever read the manuals?

A. If the engineer was working on it and he asked me to read something out of it while he was working I would, yes.

Q. Okay. As you sit here today, can you recall specifically what you might have read from any of the manuals?

A. I remember — I think he was repacking valves on there. And I remember the instructions on packing the — packing that valve. Just to say that — I believe it said that he had to use a certain kind of packing. I remember that, yes.

Q. Okay. Yesterday you told us all that you ever did with respect to the air compressors was remove the head gaskets. Now today, you're telling me that you — you read a manual and actually did repacking on the valves as well?

A. I did not say I repacked any valves. I said that's what the manual said.

Q. Okay. But you didn't personally

Page 241

do that?

A. No.

Q. Okay. Let me ask you about the head gaskets. Now, I understand this wasn't what your primary responsibility was, but there were occasions where you helped the engineer and removed some head gaskets, correct?

A. Yes.

Q. Did you have to remove anything to get to the head gasket to remove it?

A. Yes.

Q. And what was that?

A. You had to remove the top of the — the top of the — where the gasket was — the gasket was underneath the head, so you had to move that.

Q. And how did you do that?

A. With a chainfall.

Q. How long did that process take to remove the top to get to the head gasket?

A. I don't remember. You're talking about 20, 30 years ago. I don't remember how much time that was.

Page 242

Q. All right. Once you were able to get to the head gasket, you said that you used a scraper to get the gasket up?

A. Yes.

Q. What did the gasket itself look like, the appearance of it once you got the — the top off? What color was it?

A. It was a dark color. I guess I could call it either black or gray, dark gray.

Q. Okay. And did you wear any gloves or anything like that when you were working on the gaskets?

A. No.

Q. Did you have to wear a mask or anything?

A. No.

Q. And the only tool that you used to remove the gasket was a scraper?

A. Yes. If it — if it needed to be. Sometimes some parts of it would come right off; sometimes it wouldn't.

Q. Okay. So sometimes you could just manually pick it up with your hand and

take it off?

A. Not the whole thing. Some parts of it maybe — maybe would come off with your hand.

Q. Okay.

A. Because —

Q. And if you needed a little more assistance, you would use a scraper?

A. Yes.

Q. And how big was the scraper that we're talking about?

A. It was a little wider than a regular putty knife.

Q. And the majority of the time, did you have to use a scraper or could you just pull it out in pieces with your hands?

A. I wouldn't say the majority of the time I had to use a scraper, but sometimes I did.

Q. Okay. And I thought you testified yesterday that when you pulled this gasket material out, it really wasn't a dusty process, correct?

A. I'm sorry, I didn't understand

you.

Q. You told us yesterday that when you pulled the gasket material out, it wasn't really a dusty process, correct?

MR. PRESENT: Objection; misstates testimony.

But go ahead. You can answer.

THE WITNESS: No, I didn't say it was — it wasn't a dusty process. I said it — sometimes it would be if it popped, you know, if it — if it popped, it would produce dust.

BY MR. HEXSTALL:

Q. Okay. So when you were changing a gasket that popped, that's when dust was produced, correct?

A. Yes.

Q. After you got the gasket material out itself, the engineer would come in and put a solvent on and put the new gasket in, right?

A. Yes.

Q. Now, this gasket material, was it hot to the touch at all?

Page 245

A. No.

Q. How long would it take you to actually get the gasket out most of the time, if there weren't any problems?

A. Maybe 15, 20 minutes, maybe.

Q. Now, the air compressor, do you know what the temperature was of the air compressor?

A. No.

Q. And working with the engineer, it was — I believe you said Barbosa was his last name?

A. Barbarosa.

Q. Barbarosa, okay.

Were there any other engineers that you ever worked with during that three-year period?

A. No.

Q. And after you got the gasket out and left it for Mr. Barbarosa to come in and continue the repairs, would you go and do other work on the tugboat?

A. If he didn't need me we would.

Q. And were you responsible for

Page 246

ordering any of the gasket material for the air compressors?

A. No.

Q. Were you responsible for going to get the air compressors — I mean get the gasket material for the air compressors out of storage?

A. No.

Q. Do you know where they were stored?

A. In our supply department. But I — yes, I — I know where the supply was, yes.

Q. Okay. But you never had to go get the gasket material?

A. No.

Q. Did you ever see the box or packaging that the new gasket material came in?

A. Yes.

Q. And I think you told us yesterday that you didn't know who the manufacturer of that gasket material was, correct?

A. Yes, I didn't.

Page 247

Q. And — because you didn't read any of the manuals or paperwork that came with the new gasket, did you?

A. No.

Q. And you didn't read anything on the box as it related to the new gasket material, did you?

A. No.

Q. Can you tell me when the last time was that you had to remove a head gasket on the Wanamassa?

A. No, I can't.

Q. And I know this wasn't a normal part of your routine and you did it when you were asked to assist

by the engineer, but could you estimate how many times during that three-year period that you actually had to remove one of the head gaskets from an air compressor?

A. How many times I had to do it?

Q. Yes.

A. I — that's — that's hard for me to do, you know, to try to give a estimate. I — I — I'd be just guessing.

Page 248

Q. Okay. That's fair. I don't want you to guess. I'm just asking if you could give an estimate.

A. No, I can't.

Q. Does your testimony from yesterday still stand that the brakes and the packing were what you did more than anything, as opposed to working with the head gaskets?

DEFENSE COUNSEL: Objection; form.

THE WITNESS: The packing, I only pulled the packing out. I didn't replace the packing.

MR. HEXSTALL: I understand that.

BY MR. HEXSTALL:

Q. But you did that more than you did working with the head gaskets?

A. I don't know if I did it more or not. I know I did both of those jobs. I — I don't know how many times I did each one, so I can't say if I did one more than the other.

Q. Okay. Any idea by looking at the

Page 249

gasket material itself, would you be able to tell what the ingredients or the components are merely by looking at it?

A. No.

Q. And you didn't ever have to review any maintenance history or anything with respect to either of these two air compressors, did you?

A. No.

Q. Let me turn your attention now to 1982, when you were at the Philadelphia Naval Shipyard.

A. Yes.

Q. And at that time, you were on the YTM-801 Commodore?

A. Yes.

Q. And I'm going to try to streamline this a little bit. You told us yesterday that you had pretty much the same duties on the Commodore as you did on the Wanamassa?

A. Yes.

Q. So if I asked you all those same questions with respect to what you had to do

in terms of working with air compressors, would you give me the same answers?

A. Yes.

Q. Do you know — how many air compressors were on the Commodore?

A. I think they had — I think it had two also, because it had the same system. That — this was a

1944 tug. But — but all of it had been remodified to put the shaft brake on and the air whistle.

Q. And the two air compressors on the Commodore, they had the same responsibility in terms of the air horn and the brake?

A. Yes.

Q. Anything else?

A. Not that I know of.

Q. Do you know who the manufacturer was of the two air compressors on the Commodore?

A. They were also Ingersoll Rand.

Q. And what did they look like?

A. The same as the ones that was on the Wanamassa.

Page 251

Q. They looked exactly the same, same color?

A. Well, they were — yes, they were all gray. Everything engine-wise in the — a Navy tug or a Navy ship is usually gray.

Q. And in terms of how you knew it was Ingersoll Rand, was it because it was tagged as well?

A. Yes.

Q. Okay. Did you see the words Ingersoll Rand anywhere written on these two air compressors?

A. Same place. They had a tag — tag on it that was — that was — said Ingersoll Rand. And like I said, serial — serial numbers, I don't remember the — I don't know those numbers. And it was written on the — on the top of it also.

Q. And do you know what the temperature was of air in either of these compressors?

A. No.

Q. And when you would have to remove a gasket, it would again be at the request of

whoever the engineer was?

A. Yes.

Q. Do you recall the name of the engineer at that time?

A. I believe his name was Wehe. But he spelled it —

Q. What's that?

A. — he spelled it W-E-H-E.

Q. That was his last name, correct?

A. I'm sorry?

Q. His last name was W-E-H-E?

A. Yes.

Q. And how many crew members did you have on the Commodore?

A. Eight.

Q. And I think you told us that there was less maintenance that was necessary on these air compressors because there weren't as many ships coming in and out daily, right?

A. Right.

Q. But when you did have to perform some work on the head gaskets, you performed it in the same fashion as you did when it was

Page 253

on the Wanamassa?

A. Yes.

Q. And you — they came out the same way; you used the same tools, correct?

A. Yes.

Q. Can you tell me the last time you would have removed a head gasket on an air compressor on the Commodore?

A. No, I can't.

Q. On the Commodore, was there ever a time when you were on leave or on vacation or not working on the tugboat?

A. Sure. I had leave time, yes.

Q. And how long was that?

A. I don't know. It depend — I don't know how much time I was on leave. I took leave different times. Sometimes you take a week; sometimes you take two weeks. I have no idea.

Q. Do you know how many times a year that you might have been on leave —

A. No.

Q. — in one year?

A. No, I don't.

Page 254

Q. Well, would it be either one or two weeks at a time?

A. Yes.

Q. And would that be the same with respect to the Wanamassa?

A. Yes.

Q. And the last thing I want to ask you about, just briefly, is the time when you worked for Global Associates at Philadelphia Naval Shipyard.

A. Yes.

Q. That would have been 1991 to '93, correct?

A. Yes.

Q. You were the — the leading foreman. And if I understood your testimony here today, you were removing equipment from inactive ships?

A. Yes.

Q. Do you know the names of any of the ships you worked on during the two-year period?

A. I couldn't recall all the names. I can remember that two of the ships that I

was on was there also in mothballs, and I know we did remove stuff off of them, off those two.

Q. Do you know the names of those two?

A. The two that I was on, the Voge and the Davis, both were there in mothballs.

Q. Do you recall how many other ships there might have been other than those two?

A. How many ships were in mothball?

Q. Yes.

A. No, I don't know how many. That's — there was a lot of them.

Q. And as I understood your testimony yesterday, you weren't working or repairing any equipment, you were just removing it off the ships, correct?

A. That's right.

Q. And the only way that you believe that you might have been exposed to any asbestos in doing that would have been cutting some of the wire and the insulation on the wire, correct?

Page 256

A. Yes.

Q. And there was a number of manufacturers that you looked at in terms of equipment that you were taking off. And do you recall what type of Ingersoll Rand equipment you removed from some of the inactive ships during that two-year period?

A. I don't remember exactly, but it — it probably — it probably was electronic, because it wasn't a whole lot of — I didn't — I didn't pull any – I don't remember pulling any pumps off or any air compressors off.

Q. And in terms of whatever the electronic equipment might have been that was Ingersoll Rand you believe, you didn't have to disturb or repair or maintain that equipment; you just rigged it and took it off, right?

A. Yes.

Q. And what you told me and what I just asked you about in terms of the Wanamassa, when you were at Global Associates during '91 to '93, and when you were on the

Page 257

Commodore, that's your only contact you had with any Ingersoll Rand equipment during your career?

A. Well, that's — I'm sure there was Ingersoll Rand equipment on all of the ships that I was on. I didn't have to only — I didn't —

Q. Okay. But I mean —

MR. PRESENT: Please let him finish, Mr. Hexstall. Please let him finish this — you interrupted him right in the middle of a sentence. Let him finish.

MR. HEXSTALL: I'm sorry. I didn't know he was still answering. Go ahead and finish, sir, please.

MR. PRESENT: He was. And he — go ahead. You can finish your answer.

THE WITNESS: There was — I'm sure there was Ingersoll Rand equipment on all of the ships that I was on. So there were times when I would be in the engine room and maybe not in the working

Page 258

capacity and being — be in the area where somebody was working on a Ingersoll Rand or some other equipment in the engine room. That was part of the training and — that we did all the time when we were underway. We had to — in order to qualify for surface warfare specialist, you had to know generally about every part of the ship.

BY MR. HEXSTALL:

Q. And I have the list of five ships that you were on during your 20-year Navy career. You — I just want to understand your testimony. You didn't specifically work on any Ingersoll Rand equipment

while you were on any of those ships but, you think you may have been in the area when others were working on it, correct?

A. That's correct.

Q. And would you have been supervising them while they were working on any of this equipment or just generally in the area?

A. Just generally in the area for

training or for an inspection.

Q. And as you sit here today, can you describe specifically what they may have been doing when you were in an area working on any Ingersoll Rand equipment?

A. No, I cannot.

MR. HEXSTALL: Okay. Thank you, sir. That's all the questions I have for you right now.

THE WITNESS: Thank you.

- - -

EXAMINATION

- - -

BY MR. PRESENT:

Q. All right. Mr. McAfee, I do have a few questions about Ingersoll Rand based on some of the questions that Mr. Hexstall asked you. And I will proceed with them now.

I'm going to do them in the same order that — you know, that he did them in. So I'm going to start at the Wanamassa.

First thing, when we're talking about the Wanamassa, he asked you a number of questions about removing gaskets,

Page 260

head gaskets from air compressors that were made by Ingersoll Rand.

Do you remember those questions just a few minutes ago that he was asking you?

A. Yeah, he — he asked me —

Q. Scraping —

A. — was I scraping them and to describe them.

Q. That's true. Okay. Well, I have a few other questions about that, those — those experiences and then I'll move on to other issues.

But with respect to the scraping of those gaskets, when it was difficult to get off, when you would have to use a scraper to get them off, what, if anything, would happen to the atmosphere or the air that you were breathing when you would have to scrape those gaskets off the Ingersoll Rand compressors?

A. Well —

MR. HEXSTALL: Objection to form.

Page 261

BY MR. PRESENT:

Q. Go ahead. You can answer.

A. Like I — like I told him, you know, if it — if it popped in half — sometimes it would break.

Q. Right.

A. If it would break, you know, it would emit some dust into the area and then I probably would end up breathing it.

Q. Okay. And once again, Mr. McAfee used one of the international signs for the spreading of dust with his fingers.

How long — did you stay in that area when — when you — when the engineer — and I think you said his name was Barbarosa?

A. Yes.

Q. When the engineer, Barbarosa, was — would he be there while you were doing the scraping? Would he be in the same area?

A. Sometimes he would be, or he'd be going to get the new parts or doing something else at the time. Sometimes he would leave us do that. That was a simple job.

Page 262

Q. Okay.

A. That wasn't a hard job. So that — those are jobs that we would do, and he would do the technical part.

Q. Did he — was he the one that put the new gasket on?

A. Yes.

Q. Did you witness him doing that? Did you see him doing that?

A. Yes.

Q. Okay. This — I know you couldn't give a number, an exact number, you said you couldn't say an exact number to Mr. Hexstall about —

A. Uh-huh.

Q. — how many times you would remove gaskets and/or scrape gaskets off the Ingersoll Rand equipment, but is there any word that you could use to describe the frequency or lack of frequency that this would happen with? I mean, how often would you be doing that sort of thing on an Ingersoll Rand, if you could just give us — without giving us a number — a general idea,

* * *

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Page 237

Q. And how were they powered?

A. By diesel engine.

Q. Do you remember whether or not there was anything on the air compressors?

A. There was — I know there was tags on it. There was a tag on it that said what kind of compressor it was.

Q. Okay. Where was the tag located?

A. At the base, the base of it.

Q. Okay. And what — what did the tag say?

A. Ingersoll Rand, and it had a series of numbers.

Q. Did it say anything else other than Ingersoll Rand?

A. Not that I can recall.

Q. Do you recall any of the model numbers or serial numbers?

A. No, sir.

Q. Other than the tag that said Ingersoll Rand, was there any writing on the air compressor itself?

A. I believe the top of it said Ingersoll Rand too, I believe.

* * *

Page 241

do that?

A. No.

Q. Okay. Let me ask you about the head gaskets. Now, I understand this wasn't what your primary

responsibility was, but there were occasions where you helped the engineer and removed some head gaskets, correct?

A. Yes.

Q. Did you have to remove anything to get to the head gasket to remove it?

A. Yes.

Q. And what was that?

A. You had to remove the top of the — the top of the — where the gasket was — the gasket was underneath the head, so you had to remove that.

Q. And how did you do that?

A. With a chainfall.

Q. How long did that process take to remove the top to get to the head gasket?

A. I don't remember. You're talking about 20, 30 years ago. I don't remember how much time that was.

Q. All right. Once you were able to get to the head gasket, you said that you used a scraper to get the gasket up?

A. Yes.

Q. What did the gasket itself look like, the appearance of it once you got the — the top off? What color was it?

A. It was a dark color. I guess I could call it either black or gray, dark gray.

Q. Okay. And did you wear any gloves or anything like that when you were working on the gaskets?

A. No.

Q. Did you have to wear a mask or anything?

A. No.

Q. And the only tool that you used to remove the gasket was a scraper?

A. Yes. If it — if it needed to be. Sometimes some parts of it would come right off; sometimes it wouldn't.

Q. Okay. So sometimes you could just manually pick it up with your hand and

take it off?

A. Not the whole thing. Some parts of it maybe — maybe would come off with your hand.

Q. Okay.

A. Because —

Q. And if you needed a little more assistance, you would use a scraper?

A. Yes.

Q. And how big was the scraper that we're talking about?

A. It was a little wider than a regular putty knife.

Q. And the majority of the time, did you have to use a scraper or could you just pull it out in pieces with your hands?

A. I wouldn't say the majority of the time I had to use a scraper, but sometimes I did.

Q. Okay. And I thought you testified yesterday that when you pulled this gasket material out, it really wasn't a dusty process, correct?

A. I'm sorry, I didn't understand

Page 244

you.

Q. You told us yesterday that when you pulled the gasket material out, it wasn't really a dusty process, correct?

MR. PRESENT: Objection; misstates testimony.

But go ahead. You can answer.

THE WITNESS: No, I didn't say it was — it wasn't a dusty process. I said it — sometimes it would be if it popped, you know, if it — if it popped, it would produce dust.

BY MR. HEXSTALL:

Q. Okay. So when you were changing a gasket that popped, that's when dust was produced, correct?

A. Yes.

Q. After you got the gasket material out itself, the engineer would come in and put a solvent on and put the new gasket in, right?

A. Yes.

Q. Now, this gasket material, was it hot to the touch at all?

Page 245

A. No.

Q. How long would it take you to actually get the gasket out most of the time, if there weren't any problems?

A. Maybe 15, 20 minutes, maybe.

Q. Now, the air compressor, do you know what the temperature was of the air compressor?

A. No.

Q. And working with the engineer, it was — I believe you said Barbosa was his last name?

A. Barbarosa.

Q. Barbarosa, okay.

Were there any other engineers that you ever worked with during that three-year period?

A. No.

Q. And after you got the gasket out and left it for Mr. Barbarosa to come in and continue the repairs, would you go and do other work on the tugboat?

A. If he didn't need me we would.

Q. And were you responsible for

ordering any of the gasket material for the air compressors?

A. No.

Q. Were you responsible for going to get the air compressors — I mean get the gasket material for the air compressors out of storage?

A. No.

Q. Do you know where they were stored?

A. In our supply department. But I — yes, I — I know where the supply was, yes.

Q. Okay. But you never had to go get the gasket material?

A. No.

Q. Did you ever see the box or packaging that the new gasket material came in?

A. Yes.

Q. And I think you told us yesterday that you didn't know who the manufacturer of that gasket material was, correct?

A. Yes, I didn't.

Page 247

Q. And — because you didn't read any of the manuals or paperwork that came with the new gasket, did you?

A. No.

Q. And you didn't read anything on the box as it related to the new gasket material, did you?

A. No.

Q. Can you tell me when the last time was that you had to remove a head gasket on the Wanamassa?

A. No, I can't.

Q. And I know this wasn't a normal part of your routine and you did it when you were asked to assist by the engineer, but could you estimate how many times during that three-year period that you actually had to remove one of the head gaskets from an air compressor?

A. How many times I had to do it?

Q. Yes.

A. I — that's — that's hard for me to do, you know, to try to give a estimate. I — I — I'd just be guessing.

Page 248

Q. Okay. That's fair. I don't want you to guess. I'm just asking if you could give an estimate.

A. No, I can't.

Q. Does your testimony from yesterday still stand that the brakes and the packing were what you did more than anything, as opposed to working with the head gaskets?

DEFENSE COUNSEL: Objection; form.

THE WITNESS: The packing, I only pulled the packing out. I didn't replace the packing.

MR. HEXSTALL: I understand that.

BY MR. HEXSTALL:

Q. But you did that more than you did working with the head gaskets?

A. I don't know if I did it more or not. I know I did both of those jobs. I — I don't know how many times I did each one, so I can't say if I did one more than the other.

Q. Okay. Any idea by looking at the

gasket material itself, would you be able to tell what the ingredients or the components are merely by looking at it?

A. No.

Q. And you didn't ever have to review any maintenance history or anything with respect to either of these two air compressors, did you?

A. No.

Q. Let me turn your attention now to 1982, when you were at a Philadelphia Naval Shipyard.

A. Yes.

Q. And at that time, you were on the YTM-801 Commodore?

A. Yes.

Q. And I'm going to try to streamline this a little bit. You told us yesterday that you had pretty much the same duties on the Commodore as you did on the Wanamassa?

A. Yes.

Q. So if I asked you all those same questions with respect to what you had to do

in terms of working with air compressors, would you give me the same answers?

A. Yes.

Q. Do you know — how many air compressors were on the Commodore?

A. I think they had — I think it had two also, because it had the same system. That — this was a 1944 tug. But — but all of it had been remodified to put the shaft brake on and the air whistle.

Q. And the two air compressors on the Commodore, they had the same responsibility in terms of the air horn and the brake?

A. Yes.

Q. Anything else?

A. Not that I know of.

Q. Do you know who the manufacturer was of the two air compressors on the Commodore?

A. They were also Ingersoll Rand.

Q. And what did they look like?

A. The same as the ones that was on the Wanamassa.

* * *

Page 262

Q. Okay.

A. That wasn't a hard job. So that — those are jobs that we would do, and he would do the technical part.

Q. Did he — was he the one that put the new gasket on?

A. Yes.

Q. Did you witness him doing that? Did you see him doing that?

A. Yes.

Q. Okay. This — I know you couldn't give me a number, an exact number, you said you couldn't say an exact number to Mr. Hexstall about —

A. Uh huh.

Q. — how many times you would remove gaskets and/or scrape gaskets off the Ingersoll Rand equipment, but is there any word that you could use to describe the frequency or lack of frequency that this would happen with? I mean, how often would you be doing that sort of thing on an Ingersoll Rand, if you could just give us — without giving us a number — a general idea,

Page 263

using an adjective?

A. On the Wanamassa?

Q. On the Wanamassa.

A. Many.

Q. Okay. And would — would your experience with the dust and the breathing when you would have

to scrape it be the same? Would it be the same each time you did it?

A. Yes.

Q. The —the replacement part that —that —that he went and got, when he —when he brought the replacement gasket to the Ingersoll Rand compressor to install, did you get a look at that? Did you get a look at either the packaging or the actual gasket before he would put it on?

A. Yes.

MR. HEXSTALL: Objection; asked and answered.

BY MR. PRESENT:

Q. Is there anything that you can tell me about, you know, who supplied that gasket, what — what company, if you know? Did you ever notice that at any of the times

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Page 265

were on the compressor. Do you remember giving that testimony to Mr. — to Mr. Hexstall?

A. Yes.

MR. HEXSTALL: Objection; misstates testimony. He said he knew that that was done, but he wasn't there watching it.

MR. PRESENT: Okay. Well, just because you'd like that to be the testimony doesn't mean it's the case, Mr. Hexstall.

BY MR. PRESENT:

Q. Did you actually witness that happening from time to time?

A. Yes.

Q. When — when the engineer would remove the packing from the valve that was on the Ingersoll Rand compressor, what if anything would happen to the air that was in the vicinity of this activity? Can you describe that for me, when he would remove the packing?

A. (No response.)

Page 266

Q. Would it — would it cause a difference in the air?

A. If it came out in pieces, yes.

Q. Okay.

A. The old — the old packing you're talking about?

Q. Yes, the old packing.

A. Yes. Yes.

Q. What would you see? What would you see happen when he would remove the old packing?

A. You'd see little strings pop into the air, little — little dust like that would pop.

Q. Okay. Stringy dust? Is that what you're calling it?

A. Yes. Yes.

Q. And when that dust was in the air, would that have any effect on you?

A. I imagine I would breathe it.

Q. Okay.

A. Yes.

Q. Well, do you remember being in the vicinity of that dust when that would

* * *

Page 270

A. No.

Q. Did you ever see any kind of warning on any of the gaskets themselves or their packaging saying that if you breathed in dust from that material you could get lung cancer from it?

A. No.

MR. HEXSTALL: Objection.

BY MR. PRESENT:

Q. With respect to the actual Ingersoll Rand compressors, the equipment that you were working on on the Wanamassa, did you ever see any kind of warning or placard on that equipment warning you that your safety was in jeopardy and you needed to take precautions so that you wouldn't get sick from breathing in that dust? Did you ever see anything like that?

A. No.

MR. HEXSTALL: Object to form.

BY MR. PRESENT:

Q. And if I asked you — and I'm going to — I'm going to be as much of a streamliner as Mr. Hexstall. If I were to

* * *

* * *

Page 49

Q. Okay.

A. No.

Q. Did the — the Wanamassa, I guess being a tugboat, did it also have a horn?

A. Yes.

Q. And — and what was it that ran the horn on the Wanamassa?

A. A compressor.

Q. Okay. And did you do work on that compressor?

A. Yes.

Q. Okay. And do you remember who made those compressors?

A. Ingersoll Rand.

Q. Okay. And what kind of work would you do on the compressor?

A. We would assist the engineer. You know, like if we had to rig anything off, we'd rig it off. Send people to go get things for him. It depend on what he was taking off of it. If he was repacking something, you know, we — we may have to — he ask us to take the old packing out while he prepares to put the new in.

Page 50

Q. When you would take the old packing out of the Ingersoll Rand compressor, can you tell the jury what, if anything, would happen to the air or the atmosphere when you would do that?

MR. HEXSTALL: Objection; leading; form.

THE WITNESS: Well, the — the old — the old stuff usually was dried out. And it shredded, you know, and it — it would — particles of it would — would — would go into the air and stuff.

BY MR. PRESENT:

Q. And when those particles from the packing on the Ingersoll Rand compressor went into the air, how would that affect you?

A. We — we'd end up breathing it.

Q. Was there any kind of warning, either on the packing or the compressor telling you that breathing in those particles could give you lung cancer?

MR. HEXSTALL: Objection; form.

THE WITNESS: No.

Page 51

BY MR. PRESENT:

Q. And how frequently would you say — how long were you on the Wanamassa? I'm sorry.

A. Let's see, I went — '77 to '80.

Q. And during that time, how often would you say you were pulling packing or assisting other people from pulling packing off Ingersoll Rand compressors?

A. I can't pin down a number of times. I just know we were always doing something in the engine room, either packing or gaskets or pulling heads off or something down there.

Q. Okay. But —

MR. HEXSTALL: Move to strike; nonresponsive.

BY MR. PRESENT:

Q. With — with respect to the — the compressors, though can you just give me a general idea over the three years how often you would be pulling packing off an Ingersoll Rand compressor? Was it, you know, once a week, once a month? Would it depend on the

Page 52

circumstances? How was it?

MR. HEXSTALL: Objection; leading; form.

THE WITNESS: It was many times. It was many times we did it, you know.

MR. PRESENT: Okay.

THE WITNESS: It had two compressors.

BY MR. PRESENT:

Q. And — and would your experience with those particles be the same each time you did that on the two Ingersoll Rand compressors?

MR. HEXSTALL: Objection; leading.

THE WITNESS: Yes.

BY MR. PRESENT:

Q. And would you — would the effect on your breathing be the same each and every time that happened?

MR. HEXSTALL: Objection; leading.

THE WITNESS: Yes.

Page 53

BY MR. PRESENT:

Q. I know we've talked about this before, but can you tell the members of the jury that — with respect

to any of the packing that you did use, do you recall the name of the packing that you used back there on the Wanamassa?

A. I know — I know the — the ones for the — for the valves.

Q. And — and what was the name of those packings?

A. John Crane.

Q. Okay. One other question I want to ask you about the compressors, before I move to John Crane. Was there anything that you read in any kind of books or anything, you know, associated with the compressor or the packing that told you that the packing that you were pulling off was asbestos?

MR. HEXSTALL: Objection; leading.

THE WITNESS: Yes. The —

BY MR. PRESENT:

Q. Okay. And what was that?

* * *

Robson Forensic

Engineers, Architects, Scientists & Fire Investigators

ARTHUR W. FAHERTY

Marine Engineer and Mechanical Expert

Experienced in the installation, testing, start-up, safe operation, maintenance, modification, troubleshooting, upgrade and repair of marine and industrial machinery, equipment and systems.

Manufacturing Processes: General machining, welding, brazing, grinding soldering, oxyacetylene cutting, aligning, shrink fitting, liquid and dry filling, dry solids handling, slurry handling, liquid handling paint preparation, painting, hot tapping.

Manufacturing Procedures, Standards, and Specifications: Pressure vessels, power piping, high-pressure air compressors, low-pressure air compressors, pipe welding, structural welding, drawing standards, hazardous area requirements, electrical generation and switchboards.

Test Methods and Specifications: Hydrostatic testing, vibration testing, static and high speed dynamic balancing, material specifications.

Engineered Systems: Steam; condensate-steam and motor plants; condensate-landfill; feedwater; liquid fuel; natural gas; methane collection; potable water; refrigeration; salt water service; ballast; tanker cargo; fire protection; waste water; hydraulic power; pneumatic power; pneumatic controls heating; ventilation and air conditioning; bag houses; sludge;

oily water; sewage; cleaning and repair of tank farm pipelines, tanks and pumps.

Machinery: Diesel engines, fuel injection equipment, high speed centrifuges, compressors, heat exchangers, refrigeration compressors, absorption and centrifugal chillers, liquid and gas fired boilers, cooling towers, air handlers, valves and fittings, turbines, turbochargers, jib cranes, monorail cranes and hoists, winches and capstans, cargo machinery, bridge cranes, industrial scales, milling machines, lathes, presses, screw conveyors, belt conveyors, roller conveyors, drive gears, clutches, distillers, reverse osmosis, spreader beams, lifting and rigging gear, horse drawn machinery, farm tractors, vactors and industrial vacuums, elevators (passenger and freight), fuel oil blending, steering gears, hydraulic rams, rotating machinery, pumps (centrifugal, reciprocating, progressive cavity, positive displacement, screw, pneumatic).

Machinery Safeguarding: Safety interlocks, failsafe modes, caution and warning signs, machine guards, drive guards, instruction manuals, controls, damage control and damage control methods.

Safety Procedures and Requirements: Material Safety Data Sheets, right-to-know, confined space entry, lockout/tagout, scaffolding, training policies, inspections, OSHA requirements, industrial cranes – shipboard, shoreside, shipyard.

Tools: Drill press, lathes, milling machines, table and radial arm saws, rotary pneumatic drills, impact wrenches, nail guns, high pressure water blasters, high pressure washers, hand tools.

Wharfinger: Duties and responsibilities.

Products: Bicycles, motorboats – gas and diesel, Alpine and Telemark skis, rope tows.

Regulatory Compliance: American Bureau of Shipping, DnV, IACS, IMO, ISM, Marpol, U.S.C.G., OSHA.

Specialized: Graving docks, floating drydocks, marine railways, shipboard automation, shipyard contracts, assessment of marine operations, U.S.C.G. License Chief Engineer Unlimited Horsepower – Motor, Third Assistant Engineer-Steam, stability/inclining experiments, marine bulkheads.

PROFESSIONAL EXPERIENCE

2006 to present	**Robson Forensic, Inc.**	
	Area Manager for Seattle Area	2009-present
	Area Manager for Upstate/Eastern New York and Vermont	2006-2009
	Provide technical investigations, analysis, reports, and testimony towards the resolution of commercial litigation cases and personal injury cases involving commercial vessels and pleasure craft.	
1996 to present	**Arthur Faherty**	
	Consultant, Port Engineer	
	Work includes direct involvement with nuclear industry for safe operation of standby generators for shaft alignment, vibration problems and root cause	

analysis; troubleshooting large centrifugal machines for environmental clean-up in South America and purifier operations. Design work with naval architecture firm including work on installing additional engine on dynamic positioning drill vessel. All phases of shipboard operations–machinery, cargo, regulatory, human resources. Worked with German Engineering firm to market digesters for animal waste to farmers in western United States. Instructed Pipeline Hydraulics for COTCO (Cameroon Oil Transportation Company, a division of ExxonMobil), Pipeline Operators, Field Supervisors, and Pipeline Engineers for 1100 KM pipeline for pumps, pumping, hydraulic surges, system operation, testing and maintenance (Douala, Cameroon; September 2013).

1988 to 2006 **U.S. Merchant Marine Academy, Global Maritime and Transportation School**

Visiting Professor

Areas of expertise and instruction include vibration training for nuclear power plants, shipboard propulsion systems (steam and diesel), rotating machinery (reciprocating and centrifugal pumps, centrifugal and reciprocating air compressors, centrifugal and reciprocating AC compressors, purifiers), piping systems, refrigeration, including

ammonia, HVAC systems, low pressure and high pressure boiler control systems, waste treatment systems, evaporators and reverse osmosis units, Marpol regulations, Classification Society rules and regulations, electrical distribution and switchboards systems (480 and 5kV), shipboard management, shipyards, shipboard automation systems and simulation training.

Programs include Ship of the Future for the U.S. Navy, MARAD Inspectors, ABS Surveyors, Diesel Engine Training for Exxon, Military Sealift Command, ARCO, License Upgrade, Diesel Generator performance for public utilities, U.S. Army Reserve Training for vessel operations, shipyard course for U.S. Navy reserve units, National Sealift Training for Engineers (both for Superintendent Engineers and for operating personnel) for hull surveys, engine room surveys and breaking out the plants and QMED program for MSC. Courses are developed using the IMO model for classroom instruction. Co-authored assessment of Staten Island Ferry System resulting in reorganization of system to reflect shipboard safety and operating standards.

2004 to 2005 **M.V. Cape Horn, Marad ROS RO/RO, 22,000 BHP**

Chief Engineer

Responsible for main propulsion engine, diesel generators, all rotating machinery including pumps, air compressors, purifiers, reciprocating AC and refrigeration compressors and all hydraulics for ramps, car decks and winches, 40 ton electro-hydraulic crane, sewage treatment plant, evaporators, interior communications and electrical switchboard and distribution. Refurbished Bridge Control system and put it in use for the first time in more than 6 years.

1998 to 1999 **Cresmont Technical Services**

Program Manager

Program Manager to design, build and operate a 3 megawatt methane-to-energy plant in Puyallup, Washington. Consultant to develop a West Coast facility for NAVSEA and MARAD vessel scrapping. Project Manager for tugboat acquisition and vessel conversion program to convert vessels into hospital ships. Consultant to bunker suppliers for fuel problems encountered on board.

1996 to 1998 **CBS Engineering, Inc.**

Senior Consulting Engineer

Construction of barges, marine issues, plant operations and plant review. Oversaw construction and delivery of $3.8M barge (400'X 100') for production platform. Responsible for operational review of 80 megawatt gas turbine power

plant, centrifuge operations and mooring of barges to API specifications. Performed analysis for FPSO operations and cost for conversions in shipyards around the world.

1994 to 1996 **Wehran Energy**

Plant Manager

Ran all aspects of 2.5 megawatt methane gas to energy plant including investment to upgrade and plant expansion to 5 megawatts. Operation consisted of field expansion, field maintenance, compressing gas, flaring, condensate separation, electrical generation, pollution control and interfacing with town, county, and utility officials for upgrade and expansion.

1992 to 1994 **Fore River Shipyard & Iron Works, Inc.**

Owner

Shipyard repair and steel fabrication business. Drydocked vessels from barges to 860' SeaBee class LASH vessel. Experienced in blasting and painting of hulls and tanks, engine work, piping renewal, steel replacement, superstructure work, welding, brazing, oxyacetylene cutting and welding, machining (lathes, milling machines). Workforce of up to 128 people. Also accomplished steelwork for bridge sections and construction of barges for public authority. Accomplished design work for

steam driven power barges for international power plant developer for use in South America and in the Middle East. Solved issues on delivering these plants to the various areas; this included surveying various rivers in Colombia for future installations.

1988 to 1992 **AK Engineering, Inc.**

Founder, Stockholder and Vice President

Company specialized in marine and industrial engineering projects. Responsibilities included overhaul of 6 X 6.1 Megawatt diesel generators, large oil/water separation project for utilities, ultra-high water pressure technologies for utilities and U.S. Post Office (cutting into a building in NY city while mail was being processed for expansion), very fast track construction of co-generation plant (gas driven engines with absorption and centrifugal chillers, boilers, pumps and cooling towers all controlled by pneumatic controllers). Vessel activation and deactivation for Operation Desert Storm (13 vessels).

1983 to 1988 **Various U.S. Shipping Companies**

Consultant and Chief Engineer/Fleet Engineer

Chief Engineer for three re-flaggings – two vessels were from Swedish flag to U.S. flag and one vessel was from Liberian flag to U.S. flag. Installed generator control systems to make generators fully

automated. Surveyed vessels for owners to meet various RFP's with regard to budget and operational characteristics. Supervised the dry-docking of ships, accomplished troubleshooting of automation on board and provided corrective procedures, taught crews how to perform under limited manning schedules. Assumed Chief Engineer duties on poorly running vessels and returned vessels to maintenance status and in class while maintaining low overtime. Vessels included dry cargo, RO/RO, car carrier and tanker. Experienced in all types of diesel engines, generators, cranes-monorail, jib, electro-hydraulic, overhead; galley equipment including dishwashers, fryers, potato peelers, potato mashers, ovens and ventilation systems for the galleys, elevators for both people and cargo, winches, anchor handling and heat exchangers. Also experienced with impact wrenches, Sweeney wrenches, hydraulic stretching for cylinder and bearing bolts.

19[illegible] to 1983 **Pacific Gulf Marine**

Chief Engineer on Motor Vessels

Several shipyard periods and class surveys accomplished. Vessel always remained on charter.

1971 to 1983 **Various Shipping Companies**

Various Engineering Capacities from Third Engineer to Chief Engineer

Worked on German, Japanese and American vessels. Built ships in two U.S. yards and in one Japanese yard for various owners. Officer in Charge of Ammonia Refrigeration System (2 years).

1983 **Reflag of M/V American Eagle**

Chief Engineer

Responsible for the paperwork and physical work to convert the vessel from Swedish flag to American Flag including engine room and structural steel including fabricating and welding on the aft car decks.

1978 to 1983 **Pacific Gulf Marine**

Chief Engineer on Motor Vessels

Several shipyard periods and class surveys accomplished. Vessel always remained on charter.

1976 to 1978 **Zapata Bulk Transport 4 x 40,000 Product Tanker**

Machinery Inspector / Hull Inspector / Cargo Inspector

Responsible for signing off all machinery and piping in Engine room, cargo systems including pumproom and environmental trough for Class as well as machinery, cargo systems, pump room and controls for Zapata Courier.

1974 to 1975 **New Construction, Tsuneishi, Japan for Sanko Lines, 80,000 dwt Crude Oil Tanker**

2nd Engineer

Responsible for signing off fueling stations, cargo piping and environmental trays, HFO Purifiers and main engine

1973 **New Construction of M/V Sugar Islander**

3rd Engineer

Responsible at yard for sign-off on fueling stations including environmental wells, purifiers, boiler, and evaporator at Lockheed Shipbuilding, Seattle.

PROFESSIONAL CREDENTIALS

Chief Engineer, Unlimited Horsepower-Motor
Third Assistant Engineer Unlimited-Steam 8th Issue, Current through April 2010

EDUCATION

B.S., Marine Engineering, United States Merchant Marine Academy, Kings Point , NY

Additional Continuing Education: Achieving Safe Permit-Required Confined Space Entries, Prospering Safely (Fred Straub), October 2013 Current Issues in Maritime Law, WSBA, October 2011 Maritime Personal Injury CLE (Lorman), Seattle, WA, July 2011

Sulzer Brothers Diesel Program, Winterthur, Switzerland

CERTIFICATIONS

Standards Certification, American Boat and Yacht Council Certified Universal Refrigeration Certification

PRESENTATIONS

CO Poisoning: Silent, Deadly and with Us All the Time (Lessons Learned from Litigation), Western Trial Lawyers Association Convention, Maui, HI, June 13, 2013

Arthur W. Faherty being duly sworn upon his oath deposes and says:

1. I have been employed for many years in the fields of U.S. Navy equipment, and in the applications of U.S. Navy requirements under military specifications, usually referred to as mil specs and the issuances of the Secretary of the Navy and his designees and assignee and subordinates.

2. I am familiar with U.S. Navy's rating of E2 and Boatswain Mate (BM) and the work areas and functions of each rating.

3. A copy of my CV is attached hereto and incorporated herein by reference as Exhibit A.

4. I am aware of the Navy specifications for equipment for World War II era ships.

5. I have considerable experience in the interpretation of military and Navy documents.

6. I am aware of the Navy specification for the equipment for World War II era ships and later, known as general specification for Machinery Sub S1-1 page 2.

7. These specifications required warnings and safety precautions.

8. The 1936 specifications required taking of precautions and warnings.

9. I am familiar with MIL-M-15071D, which was the military specification and its predecessors including 15071A-C and the specifications referenced in paragraph 5 of that document. MIL-M-15071A-D are roughly the same and involve similar requirements.

10. 15071 states that the intent of the Navy was to accept the usual commercial manuals when roughly equivalent to the overall requirements of Navy.

11. Mil Spec 15071-D was later succeeded by MIL-15071E.

12. 15071D requires submission of the manual to the Bureau of Ships which would then adopt the manual as a Navy document.

13. 15071D requires manuals to contain safety precautions (Section 3.1.9).

14. 15071D requires that all manuals must contain notes, cautions and warnings to emphasize critical instructions. (Section 3.3.6).

15. Included was the definition of the term "warning" which is defined by the Navy as operating procedures and practices which will result in personal injury or loss of life if not correctly followed. (Section 3.3.6 (c))

16. 15071D Section 3.1.7 requires instructions to include precautions.

17. I am acquainted with the deposition testimony concerning the Plaintiff's exposure to asbestos while in the Navy, post Navy working at the Philadelphia Naval Shipyard for Global and, while not my area of expertise, while working for the US Post Office in Glassboro, New Jersey.

18. Plaintiff served on 7 Navy vessels, the USS Voge (delivered in 1963), the USS Davis, (delivered in 1955), the USS Yosemite (delivered 1942), the tug Wanamassa (delivered 1973), the USS Butte (delivered 1967) ,the tug Commodore and the USS Nitro (commissioned 1959).

19. While Plaintiff served on Voge he used Guard gloves during training for fire-fighting duties as well as for use in the gun mount, to pull spent casings. Plaintiff testified that the Guard gloves contained asbestos.

20. Plaintiff testified that as a maintainer/cleaner onboard the Voge he was exposed to asbestos dust that shook loose after the guns and/or ASROCs were fired and during the cleaning of the accumulated dust.

21. Plaintiff testified that he was exposed to asbestos on the Davis from the insulation dust that came loose when firing the guns onboard and from use of Guard Gloves, used in damage control/fire-fighting drills.

22. While on board the Yosemite, Plaintiff testified that there were two potential exposures to asbestos:

a. Once when rigging the chain fall rubbed through steam piping, taking the insulation off over their heads and dropping dust down, and

b. When removing and re-installing tiles from the mess deck where they had to scrape to remove the old tiles, creating a lot of dust.

23. On the Wanamassa, Plaintiff testified that all hands would help the engineer do repairs in the engine room on the shaft air brakes, on air compressors and on the various pumps. Plaintiff testified that due to the service hours as a harbor tug in Guantanamo Bay, there was a high amount of maintenance needed to keep the tug operational.

24. On the Commodore, the service hours were a lot less, but the work was similar.

25. Plaintiff testified that there were no warnings about the dust in any of the above cases.

26. After retiring from the Navy, Plaintiff went to work for Global Associates at the Philadelphia Naval Shipyard. Global had a contract to remove specified parts from laid-up ships that could be used on active vessels. The work involved cutting wires, freeing the equipment and rigging the equipment off the inactive vessel. Items removed included equipment made by Westinghouse, Ingersoll Rand and General Electric. Plaintiff testified that some wires were made by Westinghouse.

27. After working at Global Associates, Plaintiff testified that he worked at the US Post Office, first in Wenonah, New Jersey and then on Glassboro. In Glassboro, the janitor repeatedly buffed the floor, causing dust. When tested the results were asbestos and the flooring had to be removed.

28. I am also familiar with Department of Navy Sec Nav 62603.5 later Sec. NAV 5700.5 dates 1956.

29. This document is also known as Uniform Labeling Program for Hazardous Industrial Chemicals and Materials, hereafter Uniform Labeling Program and was in place when the Plaintiff entered the Navy.

30. The Uniform Labeling Program was designed to standardize labeling requirements for hazardous products and provide labels to contain pertinent information to warn users of potential dangers.

31. The Uniform Labeling Program applied to Labeling of all hazardous materials throughout the Navy.

32. The Uniform Labeling Program was not designed to govern the type of warning labels.

33. The Navy stated that the type of labels were to be governed by state and federal laws and regulations.

34. The Uniform Labeling Program noted that development of new products makes it mandatory that precautions should be taken including warning labels. (Section 3)

35. For poisons, a skull and cross bones was to be affixed.

36. Poison is defined as a substance with an inherent property that tends to destroy life or impair health. Asbestos is essentially a poison.

37. Paragraph 1.C of enclosure (3) defines a Class III toxic hazard as any industrial or military material which may be given off a harmful, vapor, dust, fume or mist during handling or operation. The injuries effect may arise from one exposure (acute) or repeated exposures over a prolonged period (chronic). The made of entry into the body may be by ingestion, inhalation or absorption through the skins.

38. Paragraph 2.a of the Uniform Labeling Program refers to the Warning Labeling Guide published by the Manufacturing Chemists Association.

39. This Guide, first published in 1946, requires precautionary labels for harmful dust. The reference to the guide shows the Navy's constant concern for warnings of hazards like asbestos.

40. The only conclusion that can be drawn is that espoused by Captains Lowell and Moore whose affidavits and essential conclusions I agree with based

on my many years of experience with the Navy and ships. These are attached as Exhibit D and E.

41. This conclusion is that by the time Plaintiff began his Navy service on the Voge the Navy required warnings of the hazards of asbestos in equipment for ships and that all claims that the Navy would have barred or prevented warning labels are untrue.

42. It is clear from these documents that the Navy wanted the warnings to reach Navy personal such as Plaintiff.

43. The Navy required manufacturers not only to warn on the products but to supply manuals containing warnings to each ship and precautions for use of the product.

44. Thus, when defendants sold products for use on ships that lacked warnings that met state and federal standards and/or the standards of the Manufacturing Chemists or the American Conference of Government and Industrial Hygienists this was in violation of specific Navy directions and requirements.

45. Rather than barring warnings, the Navy encouraged warnings, and the failure to warn of the hazards of asbestos violates Navy requirements.

46. The failure to include warnings and safety precautions in their manuals of their equipment violates specific Navy requirements.

47. The claim that the Navy would have barred warnings is thus false and without basis.

48. Some of the defense experts suggest that because the Navy manuals contain no warnings the Navy believed asbestos to be safe.

49. The fact that there is no discussion of asbestos hazards in Navy documents suggest the Navy did not know of asbestos hazards.

50. Asbestos was generally required on all high heat applications.

51. In many cases the suppliers of such equipment usually supplied asbestos product with/on/in their equipment.

52. Suppliers of equipment to the Navy were engaged by the Navy to participate in renovation and overhaul of their own equipment, or that of others, including asbestos containing parts in shipyard repairs.

53. Suppliers of equipment frequently supplied replacement asbestos or disturbed previously supplied asbestos as part of their activities on ships.

54. I expect to testify, at trial, on what the Navy archive records show about equipment supplied to the vessel, or vessels at issue and what the records show as individual defendants supplying original or replacement asbestos containing equipment or disturbing asbestos.

55. Generally, if a company supplied asbestos with its equipment, some of that asbestos was always present unless the record shows that the asbestos installed by the defendants was entirely removed.

56. The removal of the entire initial asbestos never occurred.

57. I cannot comment, in this affidavit, as to defendants whose material I have not yet examined, but will supplement my testimony at trial by reliance on the documents from the archives.

58. I am also prepared to discuss the use of asbestos on Navy ships.

Sworn to and subscribed Before me this 28th day of May, 2014

[Notary Stamp]

s/ Arthur Faherty
Arthur Faherty

s/ Mollee M. Grossman
NOTARY PUBLIC

STATE OF INDIANA	)	**IN THE MARION**
COUNTY OF MARION	)	**SUPERIOR**
	)	**COURT CIVIL**
	)	**DIVISION, ROOM**
	)	**TWO**
	)	**CAUSE NO. 49D02-**
	)	**9501-MI-0001**
	)	
IN RE: MARION	)	This document
COUNTY ASBESTOS	)	relates to all cases in
LITIGATION	)	the S-2 Master File
	)	

INTERSOLL-RAND COMPANY'S AMENDED ANSWERS TO PLAINTIFF'S MASTER INTERROGATORIES AND RESPONSE TO PLAINTIFF'S MASTER REQUEST FOR PRODUCTION TO DEFENDANT MANUFACTURERS/DISTRIBUTORS

INGERSOLL-RAND COMPANY, by and through its attorneys, GUNTY & McCARTHY, hereby submits the Answers and Responses aforesaid and in support thereof states as follows:

PRELIMINARY STATEMENT AND OBJECTIONS

(a) The information supplied in these Responses is not based solely upon the knowledge of the executing party, but includes some information assembled by and/or within the knowledge of the party's authorized agents, representatives, and unless privileged, attorneys. Because much of the information is of, or relates to, events of many years ago, it is impossible for this Defendant to retrieve or reconstruct some of the requested information. Many of the individuals

who might have had personal knowledge of the matters to which Plaintiffs' discovery relate are deceased or are otherwise unavailable to Defendant, and investigations to date indicated that some information in documents which might relate to matters inquired into by Plaintiffs' discovery may have been destroyed pursuant to the Ingersoll-Rand Company's record retention policy or are otherwise unable to be found. This Defendant is engaged in a continuing investigation with respect to the matters inquired into by Plaintiffs' discovery. Therefore, this Defendant reserves the right to amend these responses if new or more accurate information becomes available or if errors are discovered. Furthermore, these responses are given without prejudice to this Defendant's right to rely at trial on subsequently discovered information inadvertently omitted from these responses as a result of mistake, error or oversight.

* * *

C. The date when such activity was terminated;

D. If such activity was terminated, the reason why;

E. Within the United States was there any geographic limitation which you claim was applicable to the sales of your asbestos containing products or component parts of any asbestos containing products (Yes or No)?

If Yes state the geographical area into which you claim your asbestos containing products or component parts were sold; and

F. Identify the organizational unit of Defendant so engaged.

ANSWER: Defendant submits that to the best of its knowledge none of its corporations, companies, businesses or joint ventures, have ever mined, milled, or manufactured "asbestos products" or "asbestos containing products" as it believes these terms are defined. For over one hundred and twenty-five years Defendant has manufactured numerous types of multi-use products, including pumps, compressors, and turbo machinery that may have contained components manufactured by third parties. Some of these components and its replacement parts may have had internal part(s) consisting of gasket(s), seal packing(s), and/or brake components manufactured by these third parties that contained encapsulated asbestos fibers. Regarding these purchased internal encapsulated asbestos containing parts that may have been incorporated into its equipment, Defendant purchased them from various manufacturers based upon commercial availability and the particular application involved. Upon information and belief, some of these part manufacturers may have included Garlock, Flexitalic, Crane and/or Anchor Packing. Defendant does not maintain a list of the equipment, which may have incorporated a purchased internal encapsulated asbestos part. The asbestos content, fiber type and composition of such a part would be only within the knowledge of that part(s) manufacturer. However, as it is generally known in the industry, Defendant believes these types of asbestos-containing parts contained only chrysotile asbestos fibers. The first date any purchased internal encapsulated asbestos containing component part was utilized by

Defendant in its products in the United States is unknown. Defendant estimates that these parts were no longer utilized when viable alternative non-asbestos containing parts became commercially available from the third party manufacturers to Defendant. See also Preliminary Statement (f).

Defendant's records are not maintained in a manner that if given a specific site Defendant can state whether products with an purchased internal encapsulated asbestos containing part(s) was sold to that location. Ingersoll-Rand does not maintain its records in a manner to respond to a particular method used in the sale of its goods. Pursuant to the corporate document retention policy sales

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STATE OF PENNSYLVANIA §

COUNTY OF PHILADELPHIA §

AFFIDAVIT OF ARTHUR L. FRANK, MD, PhD.

I am a Physician and Professor of Public Health at Drexel University where I hold the position of Chair of Environmental & Occupational Health. I am also a Professor of Medicine at the Drexel University College of Medicine. I am a Board Certified medical doctor, having received my medical degree in 1972, from the Mt. Sinai School of Medicine. I have been Board Certified by the National Board of Medical Examiners since 1973; have been a Diplomat of the American Board of Internal Medicine since 1978 and with the American Board of Preventive Medicine (Occupational Medicine) since 1979. I received my Ph.D. in 1977 from the City University of New York, where I studied

in its Biomedical Sciences Doctoral Program. I have performed cancer research at the National Cancer Institute, participated in epidemiologic studies of asbestos-exposed populations, taught asbestos medicine and public health to medical students and doctors, and have devoted my professional life to the study and prevention of asbestos-related disease. I have published numerous peer-reviewed papers, book chapters and presentations on the topic of the causes and prevention of asbestos-related disease. The opinions herein are based on my own work, experiences, publications and those cited. My current CV is attached hereto. I have provided expert opinion in numerous jurisdictions, mostly for plaintiffs, on the causation between asbestos exposure and the development of mesothelioma and other asbestos-related diseases.

I hold the following opinions to a reasonable degree of medical and scientific certainty:

Outside of Court, the Mainstream Scientific Consensus, Based on a Weight-of-the-Evidence Approach, is that All Forms of Asbestos Can Cause of All of the Asbestos-Related Diseases

1. There is overwhelming, generally accepted evidence that inhalation of asbestos fibers of any type, from any source or product, causes mesothelioma (in all known locations), lung cancer, asbestosis, pleural plaques, and other cancers. I joined fifty-one (51) scientists in expressing my opinions about the hazards of asbestos in the article by Welch et al,[1] entitled

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[1] *Welch et al., Asbestos exposure causes mesothelioma, but not this asbestos exposure: an amicus brief to the Michigan Supreme*

Asbestos exposure causes mesothelioma, but not this asbestos exposure: an amicus brief to the Michigan Supreme Court. I continue to hold the opinions set forth in that published paper, along with the other opinions expressed here, to a reasonable degree of medical and scientific certainty.

Outside the courtroom, there is little or no dispute in the medical literature that all asbestos fiber types, including chrysotile, cause asbestosis, lung cancer, and pleural plaques/thickening. The methodology and bases for the opinions as stated herein are not novel and for the reasons set forth are generally accepted in the medical and scientific community.

2. There are numerous occupational epidemiology, registry and case studies clearly linking all types of asbestos, including chrysotile asbestos, to pleural and peritoneal mesothelioma.[2]

Court. Int J. Occup. Environ. Health. 13:318+327 (2007) (a copy is attached hereto). This peer reviewed paper, while presented to a court, is a reliable review of the medical and scientific literature. Welch et al. (2007) presents the peer reviewed scientific position of the signatories and is a scientific – rather than legal – review of the mainstream approach to causation of asbestos disease.

[2] Kanarek, *Mesothelioma from Chrysotile Asbestos: Update.* AEP Vol. 21, No. 9, pp. 688–97 (2011); Hein et al, *Follow-up study of chrysotile textile workers: Cohort mortality and exposure-response.* Occup. Environ. Med. 64:616–625 (2007); Loomis et al., *Lung cancer mortality and fiber exposures among North Carolina asbestos textile workers.* Occup. Environ. Med. 66:535–542 (2009); Silverstein et al., *Developments in asbestos cancer risk assessment.* Am. J. Ind. Med. 52:850–858 (2009); Finkelstein et

3. "There is general agreement among scientists and health agencies. . .[e]xposure to any asbestos type (i.e., serpentine [chrysotile] or amphibole) can increase the likelihood of lung cancer, mesothelioma, and nonmalignant lung

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al., *Mesothelioma among employees of a Connecticut factory that manufactured friction materials using chrysotile asbestos.* Ann. Occup. Hyg. 54:692–696 (2010); Egilman et al., *A case of occupational peritoneal mesothelioma from exposure to tremolite-free chrysotile in Quebec, Canada: A black swan case.* Am. J. Ind. Med. 54:153-156 (2011); Pira et al., *Mortality from cancer and other causes in the Balangero cohort of chrysotile asbestos miners.* Occup. Environ. Med. 66:805–809 (2009); Mirabelli et al. *Excess of mesotheliomas after exposure to chrysotile in Balangero, Italy.* Occup. Environ. Med. 65:815–819 (2008); Turci et al., *Role of associated mineral fibres in chrysotile asbestos health effects: The case of Balangeroite.* Ann. Occup. Hyg.; 53:491–497 (2009); Everatt et al., *Occupational asbestos exposure among respiratory cancer patients in Lithuania.* Am. J. Ind. Med. 50:455–463 (2007); Madkour et al., *Environmental exposure to asbestos-response relationship with mesothelioma.* Eastern Mediterranean Health J. 15:25–38 (2009); Yano et al., *Mesothelioma in a worker who spun chrysotile asbestos at home during childhood.* Am. J. Ind. Med.;52:282–287 (2009); Baumann et al., *Pleural mesothelioma in New Caledonia: An acute environmental concern.* Cancer Detect Prev. 31:70–76 (2007); Baumann et al., *Pleural mesothelioma in New Caledonia: Associations with environmental risk factors.* Environ. Health Perspect. 119:695–700 (2011); Nishikawa et al., *Recent mortality from mesothelioma, historical patterns of asbestos use, and adoption of bans: A global assessment.* Environ. Health Perspect. 116:1675–1680 (2008); Stayner et al., *The Worldwide Pandemic of Asbestos-Related Diseases.* Annual Rev. Public Health, 34: 4.1 – 4.12 (2013); Wang et al., *Cause-Specific Mortality in a Chinese Chrysotile Textile Worker Cohort.* J. Japanese Cancer Ass'n (2012).

and pleural disorder."[3] Many other reviews support this conclusion, such as those from the American Conference of Governmental Industrial Hygienists,[4] the American Thoracic Society,[5] the Environmental Protection Agency,[6] the International Agency for Research on Cancer (IARC),[7] the National Toxicology Program,[8] the Occupational Safety and Health Administration,[9] the Consumer Products Safety

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[3] U.S. Public Health Service, U.S. Department of Health & Human Services. Toxicological profile for asbestos. Atlanta: Agency for Toxic Substances and Disease Registry; (2001).

[4] American Conference of Governmental Industrial Hygienists. Asbestos: TLV® Chemical Substances 7th Edition Cincinnati OH: ACGIH; Report No.: Publication #7DOC-040 (2001).

[5] American Thoracic Society. *Diagnosis and initial management of nonmalignant diseases related to asbestos*. Am. J. Respir. Crit. Care Med.;170(6):691–715 (Sept. 15 2004).

[6] Environmental Protection Agency. Airborne Asbestos Health Assessment Update. Springfield VA: NTIS; Report No.: EPA/600/8-84/003F (1986).

[7] IARC, *Asbestos: Monograph on the Evaluation of Carcinogenic Risk to Man*. Lyon: International Agency for Research on Cancer; (1988); Straif K et al., *A review of human carcinogens—part C: metals, arsenic, dusts, and fibres*. Lancet Oncol.; 10(5):453-4 (May 2009).

[8] National Toxicology Program. Report on Carcinogens, Eleventh Edition. U.S. Department of Health and Human Services, Public Health Service (2005).

[9] Occupation Safety and Health Administration. Occupational exposure to asbestos; final rule. Federal Register; 59:40964-1162 (1994).

Commission (CPSC),[10] the World Health Organization[11] the Collegium Ramazzini,[12] and the World Trade Organization.[13] This scientific consensus is also reflected in the Consensus Report of the 1997 Helsinki Conference,[14] publications from the American Cancer Society,[15] and publications from the National Cancer Institute of the National Institutes of Health.[16]

4. Most recently, IARC published an update on asbestos that concluded "all forms of asbestos

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[10] Consumer Product Safety Commission. CANCER HAZARD! CPSC Warns About Asbestos in Consumer Products: Safety Alert. Report No.: CPSC Document #5080 (1994).

[11] World Health Organization. Environmental Health Criteria 203: Chrysotile Asbestos. Geneva: World Health Organization; (1998); World Health Organization. Elimination of asbestos related diseases. Ref Type: Generic (2006); World Health Organization. Environmental Health Criteria 53: Asbestos and Other Natural Mineral Fibres. Geneva: World Health Organization; (1986).

[12] Collegium Ramazzini, *Asbestos Is Still With Us: Repeat Call for a Universal Ban*. Am. J. Indust. Med. 54:168–173 (2011).

[13] World Trade Organization. European Communities – Measures Affecting Asbestos and Asbestos – Containing Products. Report No.: WT/DS135/R (2000).

[14] Tossavainen, A., *Asbestos, asbestosis, and cancer: the Helsinki criteria for diagnosis and attribution*. Scand. J. Work Environ. Health: 23(4):311-6 (Aug 1997).

[15] Malignant Mesothelioma. American Cancer Society. 10-19-2006. Ref Type: Pamphlet (2006).

[16] National Cancer Institute. Factsheet - Asbestos: Questions and Answers. Bethesda, MD, National Institutes of Health. Ref Type: Pamphlet (2003).

(chrysotile, crocidolite, amosite, tremolite, actinolite, and anthophyllite). . . . cause[s] mesothelioma and cancer of the lung, larynx, and ovary. Also positive associations have been observed between exposure to all forms of asbestos and cancer of the pharynx, stomach, and colorectum."[17] IARC described its approach to assessing "causality":

> After the quality of individual epidemiological studies of cancer has been summarized and assessed, a judgment is made concerning the strength of evidence that the agent in question is carcinogenic to humans. In making its judgment, the Working Group considers several criteria for causality (Hill, 1965). A strong association (e.g. a large relative risk) is more likely to indicate causality than a weak association, although it is recognized that estimates of effect of small magnitude do not imply lack of causality and may be important if the disease or exposure is common. Associations that are replicated in several studies of the same design or that use different epidemiological approaches or under different circumstances of exposure are more likely to represent a causal relationship than isolated observations from single studies. If there are inconsistent results among investigations, possible

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[17] IARC. Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite and Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

> reasons are sought (such as differences in exposure), and results of studies that are judged to be of high quality are given more weight than those of studies that are judged to be methodologically less sound.
>
> If the risk increases with the exposure, this is considered to be a strong indication of causality, although the absence of a graded response is not necessarily evidence against a causal relationship. The demonstration of a decline in risk after cessation of or reduction in exposure in individuals or in whole populations also supports a causal interpretation of the findings.
>
> Several scenarios may increase confidence in a causal relationship. On the one hand, an agent may be specific in causing tumours at one site or of one morphological type. On the other, carcinogenicity may be evident through the causation of multiple tumour types. Temporality, precision of estimates of effect, biological plausibility and coherence of the overall database are considered. Data on biomarkers may be employed in an assessment of the biological plausibility of epidemiological observations.[18]

5. After defining asbestos as all forms of this fibrous mineral, IARC stated that the "causal association between mesothelioma and asbestos has been well established." *Id.* IARC also

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[18] IARC. Preamble to Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite And Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

discussed some unresolved questions such as potential differences in relative potency by fiber type and the issues of fiber length.

6. Mesothelioma is a tumor of the serosal linings of the chest (the pleura), the abdomen (peritoneum), the heart (pericardium) and testes (tunica vaginalis). The cells of the serosal membranes surrounding the lungs, abdomen, heart and testes are essentially the same, at a cellular level, and react to the presence of asbestos in the same manner. All forms of diffuse malignant mesothelioma, in any location in the body, can be caused by all forms of asbestos.

7. Based on the evidence available, more than fifty (50) countries have now banned the use of all forms of asbestos.[19], [20], [21]

8. I follow the same weight-of-the-evidence methodology used by IARC, WHO and ATSDR among others, in reaching my conclusions about the health effects of asbestos. I, like those entities and many others, have considered the scientific and medical evidence in its totality, and I reach the same conclusions reached by the mainstream. The following chart is helpful to

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[19] Stayner et al., *The Worldwide Pandemic of Asbestos-Related Diseases.* Annual Rev. Public Health, 34: 4.1 – 4.12 (2013).

[20] LaDou et al., *The Case for a Global Ban on Asbestos.* Environ. Health Perspectives 118:7 (July, 2010).

[21] Collegium Ramazzini, *Asbestos Is Still With Us: Repeat Call for a Universal Ban.* Am. J. Indust. Med. 54:168–173 (2011).

understand the weight-of-the-evidence approach:

	Amosite	Crocidolite	Chrysotile
Cellular Damage	X	X	X
Genetic Damage	X	X	X
Animal Fibrosis	X	X	X
Animal Cancer	X	X	X
Human Asbestosis	X	X	X
Human Lung Cancer[22]	X	X	X
Human Mesothelioma	X	X	X

Information About the Hazards of Asbestos was Available from the Early Twentieth Century

9. Asbestos is a commercial term used to describe two families of naturally occurring minerals. Amphiboles, containing five fiber types and the serpentine variety, chrysotile, were materials known to the ancients. More than 4,000 years ago, pottery in Africa and Finland contained

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[22] This chart is for demonstrative purposes only. The scientific community has recognized that asbestos is a cause of lung cancer for 60+ years, but asbestos is also an accepted cause of other cancers as discussed in IARC. Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite and Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

asbestos, and Finnish homes were known to contain asbestos rock to pack crevices in log huts. The lamps of the Vestal Virgins in ancient Rome had wicks made from asbestos so the lamps would burn continuously, as long as they were filled with oil. Various Roman historians noted slaves working in asbestos mines were not as healthy as others, and were thought to die young.[23]

10. Charlemagne, Emperor of the Holy Roman Empire, was said to have possessed a tablecloth woven of asbestos, and would astonish his guest by cleaning his tablecloth in a roaring fire.[24] Additional history of the early use of asbestos can be found in the paper by Abratt et al.[25]

11. By 1850 chrysotile deposits were known around Thetford, in Canada, and these deposits were again appreciated following a forest fire when in the mid- 1870s outcroppings of rocks were noted to not have burned. By 1876, some 50 tons of asbestos was being mined in Quebec and brought to market through a specially built railroad. By the 1950s, over 900,000 tons per

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[23] Selikoff, Irving J., and D.H.K. Lee. Asbestos and Disease. (Academic Press, New York 1978).

[24] Stayner et al., *The Worldwide Pandemic of Asbestos-Related Diseases.* Annual Rev. Public Health, 34: 4.1 – 4.12 (2013).

[25] Abratt, Raymond P., Daniel A. Vorobiof and Neil White, *Asbestos and Mesothelioma in South Africa.* Lung Cancer. 45:S3–S6 (Supp.) (2004).

year were being mined with a value of almost 100 million dollars.[26]

12. In the early 1800s, asbestos was identified in South Africa,[27] particularly in the northwest area of Cape Province, and the name crocidolite was given to a blue-colored stone otherwise known as "wooly stone." Further interest did not occur until the 1880s and the first records of serious production did not take place until early in the twentieth century. The amount of asbestos produced was far less than from Canada, remaining below 10,000 tons per year until 1940. In the Transvaal of South Africa a different form of asbestos was mined and was called amosite, an acronym for the Asbestos Mines of South Africa. By 1970, some 80,000 tons per year of amosite was being produced. The mines from which the majority of amosite was derived were run by a small number of Europeans with 6,500 local workers of color.

13. Other locations with significant production of asbestos included Italy, Russia, the United States, Rhodesia (now Zimbabwe), and more recently, China. Italy was never a major producer of asbestos, not being able to compete with the larger quantities available in Canada. Russian production was substantial, rivaling that produced in Canada. Russian mines produce chrysotile and crocidolite. In the

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[26] Stayner et al., The Worldwide Pandemic of Asbestos-Related Diseases. Annual Rev. Public Health, 34:4.1–4.12 (2013).

[27] Selikoff, Irving J., and D.H.K, Lee. Asbestos and Disease. (Academic Press, New York 1978)

United States, deposits were mined in Vermont, Arizona, and California. Smaller deposits of anthophyllite were mined in North Carolina and Georgia. In Zimbabwe, mines became operative early in the twentieth century and reached a peak production of 95,000 tons.

14. China has become a major producer and rivals Russia in terms of asbestos production. In 2000, Russia led the world with 700,000 tons, followed by 450,000 tons from China and 335,000 tons from Canada. Canada recently halted production of asbestos. In 2000, the United States was producing only some 7,000 tons from mines in California and elsewhere, this from a worldwide production of 2,130,000 tons.[28] Not surprisingly, Russia and China accounted for most consumption of asbestos followed by Brazil, India, Thailand, and Japan. The United States used about 15,000 tons of asbestos in 2000, down from a peak of 775,000 tons per year in the early 1970s. At the present time, the United States imports even less.

15. On a per capita basis, as of about 2006, the greatest use of asbestos is in Russia and former Soviet Republic countries, and in Thailand. Among the countries with lowest per capita usage, other than in countries that have now banned asbestos, are Canada, the United States, and several others at one tenth of a kilogram per capita per year. Although on a per capita basis India ranks low, it stands fourth in

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[28] Tossavainen, A., Global *Use of Asbestos and the Incidence of Mesothelioma*. Int. J. Occup. Environ. Health. 10:22 (2004).

the world's total usage. China, while second in the world, has a relatively low per capita amount, given its large population base. Major use in the United States is for asbestos cement and roofing materials. In much of the rest of the world asbestos containing cement, construction materials, friction products, and textiles are made, used, and exported.

Commercial Uses of Asbestos

16. Although there has been historical use of asbestos, it was more a curiosity than a meaningful commercial material. This changed in the last half of the nineteenth century as asbestos began to be used in many commercial settings. For example, with industrialization and the use of steam to drive equipment, it was recognized that asbestos could serve a useful purpose as insulation material.

17. It became increasingly apparent that asbestos, because of its various properties, was extremely useful in many situations. Asbestos resists degradation under heat and cold, does not conduct electricity, and is extremely chemically resistant, including resistance to many industrial acids. Because of its heat, cold and chemical resistance asbestos was used in many products. Different types of asbestos were found especially useful for different purposes.

18. In the nineteenth century, the first systematic use of asbestos was for sealing and packing materials, soon followed by its use in the insulation for heat conservation. The manufacture of asbestos roofing felt and cement

came soon thereafter, as did the development of textile made from asbestos.[29]

19. Around the turn of the century asbestos containing cement pipe was produced, the asbestos allowing for added strength, creating lighter and thinner cement materials. The first use of asbestos as a brake lining occurred in 1906, and clutch facings were developed in 1918. In Great Britain a technique for spraying asbestos as a fireproofing material was developed in the early 1930s, and this technique was imported into the United States a few years later. Considerable use of asbestos was noted during the shipbuilding era in and around World War II. For the first time millions, including many women, were exposed to asbestos.

20. After World War II, asbestos was used as a material in plastics, in building materials such as joint compound, spackling, plaster, paint, asphalt, acoustic material, reinforcement for cement siding, and many other new uses. Asbestos was used for filtering wine, beer, and pharmaceutical products. Crocidolite asbestos was even used as a component of cigarette filters between 1952 and 1956.

21. Asbestos found its way into plasters and stuccos, was used in drilling mud for oil wells and other similar operations, and was used in automobile body under coatings. Yarns made

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[29] Stayner et al., *The Worldwide Pandemic of Asbestos-Related Diseases*. Annual Rev. Public Health, 34: 4.1 – 4.12 (2013).

from asbestos were used in a wide variety of ways, including rope, sewing threads, gas mask filters, wire covering, and for steam hoses, among others. Cloth made from asbestos was incorporated into blankets, mailbags, theater curtains and commercial products such as ironing board covers. Other consumer products, including hair dryers, toasters, play sand, and baby and adult talcum powders were shown to contain asbestos.

22. Construction materials containing asbestos included millboards, cements, laboratory table tops, electrical pump insulation and mountings, and flooring. Asbestos was found to be present in 3,000-4,000 commercial products.

23. Increasingly, the use of asbestos is being banned around the world. The current use of asbestos includes building supplies, such as roofing materials and asbestos cement pipes. Automobile brake components continue to contain asbestos, and asbestos cloth is still used in firefighting protective gear. For some countries the continued sale of asbestos is a significant economic issue. Even Canada has now, effectively, closed the Quebec asbestos mines. This is in the face of irrefutable evidence of the health hazards of all forms of asbestos, and continuing evidence, especially in developing countries, of no real "controlled use" of asbestos, including chrysotile.

24. With the ban of the use of asbestos in Japan, only developing countries continue to use large quantities of asbestos. China and India, for

example, continue to mine and use asbestos, the most frequent use being in construction materials. Thailand, another growing economic power in Southeast Asia, continues to use large quantities of asbestos as well. Encouragement for the use of asbestos in such countries comes from the West, where the hazards are increasingly well recognized and actions are being taken to reduce or eliminate the use of asbestos containing products.

Public Health Issues and the Uses of Asbestos

25. The world has a long history of asbestos use, with some suggestions of potential health hazards by the ancients. The real history, appreciating the hazards of asbestos, begins in the late 1890s.

26. The term pneumoconiosis, having been coined by Zenker[30] in 1867 after examining the lungs of a man with siderosis, was applied to an increasing number of dust diseases of the lung. In 1924, Cooke coined the term asbestosis.[31]

27. Morris Greenberg, who served as a medical member of the Inspectorate of Factories in Great Britain and is a scholar of the historical aspects of asbestos-related disease, wrote an excellent historical overview of the development of knowledge regarding the hazards of

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[30] Zenker, F.A., *Iron Lung-Siderosis Pulmonous.* Dtsc. Arch. Klin. Med. 2:116 (1867).

[31] Stayner et al., *The Worldwide Pandemic of Asbestos-Related Diseases.* Annual Rev. Public Health, 34: 4.1 – 4.12 (2013).

asbestos.[32] This article provides an excellent historical account of one aspect of the development of knowledge about the hazards of asbestos and the failings of some in the medical community.

28. In Great Britain, as early as 1898, the Lady Inspector of Factories made note of the fact that asbestos was causing disease among asbestos textile workers.[33] In 1899, Dr. Murray conducted a post-mortem examination on a young man in his mid-thirties who died of respiratory insufficiency. Dr. Murray reported, during the patient's hospitalization, that he was the tenth individual in his particular work area to die, and that his working brethren had all preceded him in death at a young age from similar problems. Dr. Murray noted the man had extensive interstitial fibrosis, and what was described as "curious bodies" in his lungs. In 1907, the autopsy findings, with commentary, were published and unfortunately concluded that proper ventilation was now thought to be in place to spare additional workers disease in

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[32] Greenberg et al., *The Doctors and the Dockers*. Am. J. Ind. Med. 45:573 (2004); Greenberg, Morris, and T.A. Lloyd Davies. *Mesothelioma Register 1967–68*. Br. J. Ind. Med. 31:91 (1974).

[33] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1898, Her Majesty's Stationery Office, p. 171 (1898).

the future.[34] Unfortunately, because this was far from correct.

29. In 1915 Collis, after giving a series of lectures, wrote up his findings on pneumoconiosis and discussed the problems of silicosis and asbestos-induced fibrosis, not yet called "asbestosis."[35] The term asbestosis was not used until 1924 when Cooke coined the term to describe pulmonary fibrosis due to the inhalation of asbestos dust.[36] By 1930, Merewether and Price wrote of the principles to protect workers in England,[37] and Lanza in the United States showed that suggested levels of asbestos in the late 1930s were often too high to protect workers.[38]

30. Although previously unnamed, the disease entities caused by exposure to asbestos were not unappreciated. In 1918, the Prudential Life Insurance Company, which insured workers in Canada and the United States, had called to its attention by one of its vice presidents, who was

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[34] Murray, H.M. Departmental Committee on Compensation for Industrial Disease, Minutes of Evidence, Appendices and Index, p. 127 (Wyman and Sons, London, 1907)

[35] Collis, E.L. *The Pneumoconiosis*. Publ. Health. 28:252–264 (1915).

[36] Cooke, *W.E. Fibrosis of the Lungs Due to the Inhalation of Asbestos Dust*. Br. Med. J. 2, p. 147 (July 26, 1924).

[37] Merewether, E.R.A. and C.W. Price. *Report on the Effects of Asbestos Dust on the Lungs and Dust Suppression in the Asbestos Industry*. Her Majesty's Stationery Office (1930).

[38] Lanza, *Silicosis and Asbestosis*, Etiology, Symptoms, Diagnosis Oxford University Press, page 59 (1938)

a statistician, there was harm in breathing asbestos dust. At this point in time, Prudential ceased issuing policies on the life of asbestos workers.

31. Although not reported in the scientific literature until many decades later by Tweedale, relatively recent revelations written up revealed at least one major asbestos company in England knew, beginning in the 1920s their workers were dying of lung cancer and mesothelioma, and they worked diligently to suppress this information.[39]

32. Since 1930, and probably earlier, asbestos dust had been recognized as a hazard wherever visible dust could be seen. In 1930, Merewether and Price stated that "[i]f there is visible asbestos dust, then the invisible dust is in dangerous concentration."[40]

33. Beginning in 1946, the American Conference of Governmental Industrial Hygienists ("ACGIH") began publishing a list of Maximum Allowable Concentrations ("MAC") and later published Threshold Limit Values ("TLV") for various harmful substances, including asbestos. The first MAC for asbestos was set "without any review of research or data" and the committee wrote that the values were "not to be construed

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[39] Tweedale, G. From Magic Mineral to Killer Dust: Turner and Newall and the Asbestos Hazard. Oxford University Press (Oxford 2000).

[40] Merewether, E.R.A. and C.W. Price. *Report on the Effects of Asbestos Dust on the Lungs and Dust Suppression in the Asbestos Industry*. Her Majesty's Stationery Office (1930).

as recommended safe concentrations."[41] This TLV, designed only to reduce asbestosis, was "known to be inadequate when first proposed, was severely criticized between 1946 and 1968, but nonetheless was promulgated annually and remained unchanged until 1971."[42]

34. The protective measures necessary to prevent asbestos disease are the same for asbestosis, lung cancer, mesothelioma or other malignancy. A company that protected its workforce, their families and bystander co-workers against any asbestos-induced disease would have reduced the risk to its work force from all asbestos-induced diseases.

35. Since the beginning of the twentieth century the protective measures a company should take to protect its workforce from exposures to toxic dust have included:

- Warning workers of dangerous health effects and how to avoid harm
- Instructing workers on hazardous substances and giving out warning literature
- Repeating instructions frequently

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[41] Egilman, et al, *The origin and development of the asbestos threshold Limit Value: scientific indifference and corporate influence*. Int. J. Health Serv., 25(4) :667–96 (1995).

[42] Egilman, et al, *The origin and development of the asbestos threshold Limit Value: scientific indifference and corporate influence*. Int. J. Health Serv., 25(4) :667–96 (1995).

- Posting warnings and providing constant supervision of working conditions
- Using proper ventilation and housekeeping
- Controlling dust at the place of origin to prevent inhalation and ingestion
  Substituting safer materials for more hazardous materials and/or processes
- Requiring showers and separate lockers for non-work and work clothing, and frequent cleaning of clothing
- Routine, periodic medical examination of the workers and notification of findings
- Use of respirators, as necessary

36. If implemented, these measures would protect the worker, bystander and other workers on the jobsite, and the workers' spouses and children from exposure to toxic substances that might be brought home on workers' clothes. It was reasonably foreseeable this could occur from at least 1930, and probably before.

37. It was for this reason – to give workers the knowledge of the need to protect themselves and their families – that Merewether and Price recommended the workers be given a "sane appreciation of the risk" of working with asbestos.[43]

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[43] Merewether, E.R.A. and C.W. Price. *Report on the Effects of Asbestos Dust on the Lungs and Dust Suppression in the Asbestos Industry*. His Majesty's Stationery Office (1930).

38. Thirteen years before Merewether and Price wrote about the hazards of asbestos, Alice Hamilton, a pioneer of industrial hygiene and occupational medicine, made clear it is the job of the industrial physician to prevent occupational disease and factories very well may be poisoning neighborhoods: In a factory using "litharge and red lead" that was covered "with layers of these poisonous dusts," Hamilton described the plant manager, disappointed about her lack of excitement about the facilities:

> One of them finally brightened up, and said "Come and see this." I saw a wonderful air-washing machine, very expensive. He said "Every cubic foot of air is washed before it comes in." I felt like saying, "*You had better wash it before it goes out, or it will poison the neighborhood.*"[44]

39. In 1942, General Electric Co. and the State of Pennsylvania discussed methods to prevent

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[44] Hamilton, Alice. *The Fight Against Industrial Diseases – The Opportunities and Duties of the Industrial Physician.* Pa. Med. J. Vol. XXI, No. 6, 378–381 (1918). It was recognized that companies should provide adequate medical facilities at work, that changes of work clothing should be furnished by the employer, that showers should be provided to reduce exposures, and that ventilation to remove hazardous dusts is recommended. *Id.* The need to keep clean work areas, to use wet methods, to use ventilation, to avoid dry sweeping during cleanup and to provide respirators was well known where toxic dusts were present. Miller, Grier. *The Health Hazards of Cigar Manufacturing with Suggestions for Obviating Them.* Pa. Med. J. Vol. XXI, No. 6; 360–364 (1918).

spreading workplace poisons beyond the workplace including shower baths, and separate street clothing and work clothing

40. By 1953, the Walsh-Healy Act similarly required showers, separate lockers for street clothes and work clothes, and other protections to prevent asbestos from leaving the jobsite and poisoning family members.

41. The first published suggestion of the relationship of asbestos exposure and lung cancer was by Drs. Lynch and Smith, making observations of workers at a South Carolina asbestos textile plant.[45] They did not have definitive proof this occurred, but by 1942, Hueper, then director of occupational cancer studies at the National Cancer Institute, concluded the available data was sufficient for him to write he felt asbestos caused lung cancer.[46] This was repeated in the scientific literature several times in the 1940s and early 1950s. In 1955, should there have been question in anyone's mind, Doll reported on lung cancer in excess in Great Britain due to asbestos.[47] Interestingly, this data came from the Turner and Newall Company, where lung cancer cases and pleural cancers had been

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[45] Lynch, Kenneth M. and W. Atmar Smith. *Pulmonary Asbestosis III: Carcinoma of Lung in Asbestos-Silicosis*. Am. J. Cancer. 24:56 (1935).

[46] Hueper, W.C. Occupation Tumors and Allied Diseases (C.C. Thomas, Springfield, 1942).

[47] Doll, Richard. *Mortality From Lung Cancer in Asbestos Workers*. Br. J. Ind. Med. 12 (2):81–86 (1955).

accumulating since the 1920s, but had not been previously reported.[48]

42. For the problem of mesothelioma, case reports began accumulating in the 1940s, and by the early 1950s there were studies relating asbestos to the development of this form of malignancy. The evidence linking cancer to asbestos was strong enough that the most prestigious medical journal in America, the Journal of the American Medical Association (JAMA) published an editorial on the topic in 1949.[49] The JAMA article serves as a benchmark for general acceptance that asbestos was a carcinogen. By the middle 1950s, asbestos was "known" as a cause of cancer[50] in the industrial hygiene community and it was clearly recognized that the Threshold Limit Values (TLVs) and Maximum Allowable Concentrations (MACs) were not aimed at preventing cancer. By 1958, the American Industrial Hygiene Association (AIHA) published that exposure to asbestos, including during gasket, packing and brake work, was

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[48] Tweedale. *The Rochdale Asbestos Cancer Studies and the Politics of Epidemiology: What You See Depends on Where You Sit*, Int. J. Occup. Environ Health 13 :70–79 (2007).

[49] Editorial, J.A.M.A., *Asbestosis and Cancer of the Lung*, (August 13, 1949). This editorial discusses pleural and lung cancer and considers both human and animal data.

[50] Cook, *Symposium on Threshold Limit – Present Trends in MAC's*. Ind. Hyg. Quarterly (Sept. 1956) (recognizing the TLVs hadn't addressed the "perplexing problems" of "cancerigens" and listing asbestos among the known causes of cancer).

associated with asbestosis and lung cancer.[51] The work of Wagner et al. (1960), in South Africa, clearly related exposure to crocidolite asbestos and the development of this disease and cited earlier cases.[52] Interestingly, the cases reported by Wagner included not only mineworkers, but also included non-occupational and environmentally-exposed patients.

43. Newhouse et al. (1965) reported mesothelioma from household and environmental exposures to asbestos, in addition to occupational exposures.[53] Environmental exposures can also apply to those living near asbestos utilizing facilities. Similar experiences have played out

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[51] AIHA Hygienic Guides, Asbestos (1958). The AIHA Hygienic Guides were available to anyone who wanted them for $0.25/each. It had been recognized that asbestos from brake linings, gasket and packing caused asbestosis as early as 1932. (Merewether, E.R.A. Memorandum on the Industrial Diseases of Silicosis and Asbestos, Her Majesty's Stationery Office (1932)).

[52] Wagner, J.C., C.A. Sleggs and P. Marchand. *Diffuse Pleural Mesothelioma and Asbestos Exposure in North Western Cape Province*. Br. J. Ind. Med. 17 (4):260–271 (1960) (reporting on cases of mesothelioma due to occupational, household and environmental exposures to asbestos).

[53] Newhouse et al, *Mesothelioma of Pleura and Peritoneum Following Exposure to Asbestos in the London Area*. Br. J. Ind. Med. 22 (4):261–269 (1965).

in Japan[54], Italy[55] and elsewhere. Lieben and Pistawka (1967), of the Pennsylvania Department of Health reported several cases from both neighborhood and household asbestos exposures that resulted in mesothelioma.[56] Anderson et al. (1979) and Anderson (1983) reported on familial exposure to asbestos and disease showing both non-malignant and malignant disease occurring in family members not otherwise exposed to asbestos.[57] Vianna and Polan is a particularly interesting epidemiological study documenting a substantially (ten times) elevated risk of mesothelioma in the wives or daughters of asbestos workers, one of whose husband worked

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[54] Kurumatani et al., ***Mapping the Risk of Mesothelioma Due to Neighborhood Asbestos Exposure.*** Am. J. Respir. Crit. Care Med. Vol 178. Newhouse, in London, showed, among other things, that a number of individuals developed mesothelioma simply from living near an asbestos utilizing facility.

[55] Barbieri et al., ***Asbestos Fibre Burden in the Lungs of Patients With Mesothelioma Who Lived Near Asbestos-Cement Factories.*** Ann. Occup. Hyg. 56(6) 660 – 670 (2012).

[56] Lieben, J. and H. Pistawka. ***Mesothelioma and Asbestos Exposure.*** Arch. Environ. Health. Apr. 14 (4):559, 559–563 (1967).

[57] Anderson, Henty A., R. Lilis et al. ***Household Exposure to Asbestos and Risk of Subsequent Disease.*** Dusts & Disease. 145–146 (R.A. Lemen and J.M. Dement eds., 1979); Anderson, Henry A., Ruth Lilis et al. ***Asbestosis Among Household Contacts of Asbestos Factory Workers.*** Ann. N.Y. Acad. Sci. 330: 387–399 (1979); Anderson, Henry A. ***Family Contact Exposure.*** Proceedings of the World Symposium on Asbestos 349–362 (Canadian Asbestos Information Center (1983)).

as a brake lining worker.[58] The scientific evidence consistently confirms there is no safe level of exposure to asbestos when it comes to the disease mesothelioma as evidenced by the report of Ruiz et al. (2011) discussing the wife of an auto brake mechanic with peritoneal mesothelioma.[59] NIOSH has recognized mesotheliomas have been caused with as little as one day's exposure.[60]

44. Over the years, studies have shown other forms of cancer can be caused by asbestos. While there continues to be some controversy, it is generally accepted that gastrointestinal tract cancers, laryngeal cancers, kidney cancers and ovarian cancers are all found in excess following exposure to asbestos, the risk increasing with increasing exposure.[61]

45. As more and more groups of individuals exposed to asbestos have been looked at, evidence of

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[58] Vianna, Nicholas J. and Adele K. Polan. *Non-Occupational Exposure to Asbestos and Malignant Mesothelioma in Women.* Lancet. 311 (8073):1061–1063 (1978).

[59] Ruiz et al. *Mesothelioma Peritoneal Maligno – Informe de un Caso y Revision de la Lituratura.* Rev. Med. Inst. Mex. Seguro Soc. 49(1):79–84 (2011).

[60] NIOSH, Revised Recommended Asbestos Standard, DWEW (NIOSH) Publication No. 77–169 (December 1976). Animal inhalation studies have demonstrated that a single day's exposure to chrysotile asbestos can cause mesotheliomas. Wagner et al., *The Effects of the Inhalation of Asbestos in Rats*, Br. J. Cancer 29: 252 (1974).

[61] IARC. Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite and Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

asbestos-induced disease is found. While there clearly appears to be a threshold phenomenon with regard to the development of asbestosis, no such threshold appears to exist for asbestos-related cancers, although a dose-response relationship exists. Time since first exposure and individual susceptibility may also play a role in increasing the risk of mesothelioma.

46. While most studies of asbestos and the development of human disease have focused on individuals occupationally exposed, there is an increasing body of evidence that non-occupational exposure, usually called environmental or bystander exposure, can lead to the development of asbestos-related disease.[62] This is true for findings such as pleural plaques, where in Finland individuals living near an asbestos mine developed plaques with some regularity, but similar individuals in areas where no asbestos mines exist do not. Wagner et al.,[63] in their classic 1960 paper regarding mesothelioma, spoke to the issue of individuals with environmental exposure developing mesothelioma as fibers were moved from the site of extraction to enter the delivery

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[62] Kivoluoto, R. *Pleural Calcification as a Roentgenologic Sign of Non-Occupational Endemic Anthophylite Asbestos.* Acta. Radiol. (Suppl.) 194:65 (1960); Newhouse, Muriel L. and Hilda Thompson. *Mesothelioma of Pleura and Peritoneum Following Exposure to Asbestos in the London Area.* Br. J. Ind. Med. 22 (4):261–269 (1965).

[63] Wagner, J.C. *Diffuse Pleural Mesothelioma and Asbestos Exposure in the North Western Cape Province.* Br. J. Ind. Med. 17(4):260–271 (1960).

system, on their way to entering general commerce.[64]

47. In the United States, a current issue of environmental exposure is the situation in Libby, Montana, where a tremolite-containing vermiculite mine has injured workers and townspeople, and the product has caused additional disease after entering general commerce. [65]

48. A somewhat more specific phrase, either called household exposure or familial exposure, exists when family members develop asbestos-related disease. Anderson looked at family members of asbestos-exposed workers. Even family members moving into a contaminated household after the workers has stopped bringing in asbestos can lead to the development of the disease.[66]

49. It has also been long known that a prudent work practice to insure worker safety and health was to restrict exposures to toxic and harmful substances to the workplace where they could be controlled. For example, in 1913, Tolman

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[64] Pan et al., *Residential proximity to naturally occurring asbestos and mesothelioma in California.* Am. J. Respir. Crit. Care Med. 172:1019+1025 (2005).

[65] Peipins, Lucy A., Michael Lewin et al., *Radiographic Abnormalities and Exposure to Asbestos-Contaminated Vermiculite in the Community of Libby, Montana, USA.* Environ. Health Perspect. 111 (2):1753–1759 (2003).

[66] Anderson, Henry A., Ruth Lilis et al. *Asbestosis Among Household Contacts of Asbestos Factory Workers.* Ann. N.Y. Acad. Sci. 330:387–389 (1979).

and Kendall published their manual on methods for preventing occupational accidents and disease and emphasized the need to segregate work place exposures from the home environment:

> The importance of wearing suitable clothing on the premises should be strongly impressed upon workers in dangerous trades. The ordinary or street-clothes should be taken off and replaced by special suits to be worn during working hours. It is not sufficient for a working-suit, jacket or apron to be put on *over* the ordinary clothing. The working-suit should be taken off before the midday meal and before leaving the factory and exchanged for street clothes. . . . By removing the working-clothes before meals and before leaving the factory the poison is not carried into lunchrooms or into the homes of workers.[67]

50. Tolman and Kendall also stressed the importance of employers providing their workers with rooms for changing clothing which should include individual lockers and adequate washing facilities.

51. At the Fifth Conference of Industrial Physicians and Surgeons in 1918, Henry Field Smyth, another pioneer in toxicology and industrial hygiene, identified asbestos as an industrial

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[67] Tolman, W.H. and L.B. Kendall. SAFETY, Methods For Preventing Occupational and Other Accidents and Disease. **p. 249–249** (Harper & Brothers Publishers, New York & London, 1913).

hazard to be monitored.[68] At that same conference, all the major industrial hygiene steps mentioned by Merewether and Price (1930) were recommended including teaching the workers about: (1) the hazards of the workplace; (2) need for cleanliness and post-exposure bathing; and (3) the need for protective clothing.[69] The need to keep clean work areas, to use wet methods, to use ventilation, to avoid dry sweeping during cleanup and to provide respirators was well known where toxic dusts were present.[70] While some of the early literature discusses the concepts of worker protection in the context of other materials, it is clear the concepts applied to asbestos or any toxic dust.

52. In 1943, in their Manual of Industrial Hygiene and Medical Service in War Industries, the United States Public Health Service emphasized the importance of providing changing rooms for "employees whose clothes are exposed to contamination with poisonous, infectious, or irritating material." The Manual further stated for workers using toxic substances, "work clothes should be provided

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[68] Smyth et al. *A Preliminary Report on Dust Studies in Various Industries.* Pa. Med. J. Vol. XXI, No. 6; 365–368 (1918).

[69] *See* Schereschewsky, J.W. *Some Medical and Surgical problems and their Solution.* Pa. Med. J. vol. XXI, No. 6:355+359 (1918).

[70] Miller, T. Grier, *The Health Hazards of Cigar Manufacturing with Suggestions for Obviating Them.* Pa. Med. J. Vol. XXI, No. 6:360–364 (1918).

and laundered by the employer." The general acceptance of the need to segregate workplace exposures from the home is demonstrated by a memorandum written by Roy S. Bonsib, an industrial hygienist at the Standard Oil Company in 1948. Bonsib wrote:

> Appropriate work clothes, properly fitted and maintained, play a prominent part in an industrial worker's health and efficiency. This is especially true when persons are working with more or less toxic or carcinogenic materials or where cleanliness is a factor in the maintenance of product quality. Consequently, many of the more progressive industrial organizations, such as E.I. DuPont de Nemours & Company, the American Cyanamid Company and Borden Company, have for years supplied their employees with work clothing and have instituted a laundry service.[71]

53. In 1952, the United States Department of Labor issued safety and health standards concerning worker safety and that all contractors

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[71] Bonsib, Roy S., *Memorandum, Industrial Work Clothes: Their Provision and Laundering*. Medical Department, Standard Oil Company (N.J.) (January 28, 1948). (written for members of American Petroleum Institute Medical Advisory Committee). Eleven (11) years earlier, Bonsib, in a widely published memorandum, discussed the health hazards of working in dust-producing operations involving asbestos. Bonsib, Roy. S., *Memorandum*, Dust Producing Operations in the Production of Petroleum Products and Associated Activities – A Medico-Safety Survey, Medical Department, Standard Oil Company (N.J.) (July, 1937).

performing contract work under the Walsh-Healy Act. Walsh-Healy specifically regulated asbestos as harmful and required the contractor reduce exposures to asbestos below the TLV of 5 MPPCF. Among the health requirements was the provision that:

> Workers who handle or are exposed to harmful materials in such a manner that contact of work clothes with street clothes will communicate to the latter the harmful substances accumulated during working hours should be provided with facilities which will prevent this contact and also permit the free ventilation or drying of the work clothes while they are not in use. In any plant where it is necessary for both male and female employees to change clothes, separate dressing rooms should be provided.[72]

54. Segregation of work clothing contaminated with industrial dusts and chemicals from the home environment was recommended by the government and industry because it had been known since the 1930s introducing such substances into the home put the worker's family at risk for contracting disease.[73] For

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[72] Safety and Health Standards For Contractors performing Federal Supply Contracts under the Walsh-Healy Public Contracts Act, United States Department of Labor, at p. 25 (1952).

[73] Commonwealth of Pennsylvania: A Preliminary Report of the Dermatological and Systemic Effects of Exposure to Hexachloro-Naphthalene and Chloro-Diphenyl. Bureau of Industrial

example, in 1935, chloracne from exposure to polychlorinated biphenyl (PCB) was described in family contacts of a chemical worker who was employed in a PCB manufacturing facility. Similarly, in 1949, it was recognized a family member's exposure to beryllium from worker's clothing could result in non-occupational berylliosis.[74]

55. While it may seem like household exposures are low-level exposures, but often is not the case. As one asbestos company executive explained the nature of household exposure as he criticized a study discussing household exposures:

> Over and above other deficiencies in this study, is the erroneous assumption that household exposures to asbestos have been minimal in dose relationship concept. The precise opposite is more likely the truth. As recognized by Selikoff and others, the impregnation of drapes, rugs, furniture etc. with asbestos fibers and the constant resuspension of fiber in the respirable range creates an exaggerated hazard. Once asbestos is carried home by the workman, it

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Standards, Department of Labor and Industry, Hamsburg, PA, Special Bulletin 43, March 16, 1935 (cited in Anderson, Henry A. Household Exposure to Asbestos and Risk of Subsequent Disease. Dusts and Disease, Pathotox Publishers, Inc., Eds. Lemen and Dement, 1979 at p. 145).

[74] Eisenbud, M., *Non-occupational Berylliosis*. J. Ind. Hyg. Toxicol. 31:282–294 (1949) (cited in Epler, G.R. *Asbestos-Related Disease from Household Exposure*. Respiration. 39:229–240, 235 (1980)).

> accumulates in the home, and its presence in the home is likely to be permanent. Once it gets into the rugs, for example, it becomes resuspended by movements such as brushing and walking and therefore, family members are getting a 24-hour a day, 7-day a week, exposure, relatively speaking, rather than a partial exposure. Of greater concern is the fact that the entire population of the family, including the very young and the very old, are exposed. Experimental and clinical data on the induction of cancer establish that the very young are more susceptible to carcinogens.[75]

56. Anderson et al. (1979) found that living with an asbestos worker led to a seven-fold increase in radiographic evidence of asbestos abnormalities.[76]

57. It has long been known it is important to prevent toxic substances from leaving the workplace. Given the abundant evidence of the carcinogenic nature of asbestos, the lack of a safe level, and the knowledge that asbestos can contaminate the cars and homes of workers, companies involved in the manufacture, sale and/or use of asbestos or asbestos-containing products, should have provided work clothing,

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[75] Comments of Johns-Manville corp. with respect to Notice of proposed Rulemaking Occupational Exposure to Asbestos, Fed. Reg. (October 19, 1975) (emphasis in original).

[76] Anderson, Henry A., R. Lilis et al. *Asbestosis Among Household Contacts of Asbestos Factory Workers.* Ann. N.Y. Acad. Sci. Vol. 330:387–398 (1979).

showers and change rooms that prevented contamination of street clothing with asbestos.

58. The concept that there is no safe exposure to a carcinogen is neither a new or novel opinion in the industrial hygiene, medical and scientific community; rather the literature is loaded with physicians and scientists reaching that opinion. For example, in 1948 American Petroleum Institute recognized that there was no safe level above zero for benzene.[77] In 1956, one asbestos company scientist published his opinion that "it is prudent to set the standard for cancerigenic substances substantially at zero . . . and no considerations can justify allowing inhalation of any concentration which is avoidable."[78]

59. Recognizing that the TLVs had not been devised to protect against cancer, Stokinger suggested building a 100 - 500 times safety factor into the TLV that was set for non-cancer outcomes.[79] The TLV for asbestos required counting all

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[77] American Petroleum Institute Toxicological Review – Benzene (1948).

[78] Smyth, Jr., Henry F. *Improved Communication – Hygienic Standards for Daily Inhalation.* Am. Ind. Hyg. Quarterly. 17(2): 129–185 (1956) (Dr. Smyth was an employee of Union Carbide, which at the time was a major manufacturer of asbestos-containing phenolics and which later became a major miner and distributor of asbestos).

[79] For the 5 MPPCF TLV for asbestos, this would mean reducing the TLV to 10,000 PPCF – 50,000 PPCF. One company, Duponts, actually did create an in-house TLV for asbestos of 500,000 PPCF. E.I. Dupont de Nemours & Co., Memorandum, Engineering Department, (May 2, 1968) (setting TLV for "total dust" at 500,000 particles per cubic foot).

particles in the air if asbestos dust was being generated – *i.e.* the TLV counted all dust particles in a cloud containing asbestos. If Stokinger's safety factor proposal were applied to the 5 MPPCF TLV for asbestos and converted to the current counting method (f/cc), the asbestos TLV to protect against cancer would be either 0.06 f/cc (using the more protective 500 times safety factor) and 0.3 f/cc (using less protective 100 times safety factor).[80] Thus, in 1955, to protect against cancer, Stokinger's more protective cancer safety factor, if applied, would have advocated exposures less than today's OSHA PEL. It is important to recognize that by 1955, it was clear that the 5 MPPCF TLV wasn't even fully protective for asbestosis.

60. Again in 1964, the widely held belief there was no safe level of asbestos exposure was discussed

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[80] This calculation was performed assuming that 1 MPPCF = 6 f/cc and therefore 5 MPPCF = 30 f/cc, direct calculation based on conversion particles per cubic foot (assuming all particles were fibers) to fibers per cubic centimeter. 30 f/cc ÷ 100 = 0.3 f/cc and 30 f/cc ÷ 500 = 0.06 f/cc. The direct conversion of MPPCF to fibers/cc ignores the fact that the TLV was a total dust standard and, for any product other than pure asbestos, this calculation would underestimate the safety factor proposed by Stokinger. While I – and most scientists – recognize that the conversion factor adopted by NIOSH was not in any way reliable, the unfortunate fact remains that it was used to create the first OSHA standards. I use this conversion factor to illustrate that even using the least protective interpretation of the historic exposure guidelines, the approach suggested by Stokinger would have required greater protection than went into place for more than a decade under OSHA. This was due, in large part, to the political pressure exerted by the asbestos industry in the rulemaking process.

by several asbestos company scientists at a major meeting called the *Conference of the Biological Effects of Asbestos*. U.S. Rubber's medical officer expressed the opinion clearly and concisely:

> Our own conclusion, as we began seeing what was happening in our own process, was that *the only safe amount of asbestos dust exposure was zero* and that the efforts in terms of achieving that lay basically in engineering, and, secondly, in education. But as far as a safe level of asbestos dust is concerned, our own conclusion in Hogansville, Ga., is that *there is no safe level. The safe level is nil and anything above the safe level represents certain risk.*[81]

61. A British company official offered his own thoughts at that same meeting: *"We do not believe there is any safe limit.* We have our own ideas as to how low we can get and we are always striving to get right down to zero. . . . we know there is no scientific basis for [the asbestos TLV of 5MPPCF] whatever."[82]

62. Despite the well-discussed weaknesses of the TLV, several companies continued to use the outdated, unsupported values to guide themselves and their customers. For example, despite having had personnel present at the

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[81] Wells, J. Discussion. Ann. N.Y. Acad. Sci. 132 (1)1–766 (1965) (reporting discussion at p. 336) (emphasis added).

[82] Addingley, C.G. Discussion. Ann. N.Y. Acad. Sci. 132(1)1–766 (1965) (reporting discussion at p. 335) (emphasis added).

1964 Conference on the Biological Effects of Asbestos, Union Carbide continued to distribute its "Asbestos Toxicology Report" from 1965 into the 1970s. This "Asbestos Toxicology Report" contained several misleading statements and inappropriately suggested that the TLV's mentioned were designed to protect against cancer. Particularly misleading was the following conclusion provided by Union Carbide's Industrial Medicine and Toxicology Department: "In conclusion, while asbestos dust in excess of the Threshold Limit Value is potentially harmful, as are many other dusts encountered in industry, it is readily controlled as other such dusts and it can be used safely with appropriate precautions."[83,84]

63. By the middle 1960s, anyone wanting to discover the hazards of asbestos, could have done so by simply going to a major library. For example, one Union Carbide salesman in the United Kingdom uncovered most of the widely accepted hazards of asbestos by simply going to the library.[85] Mr. Sayers indicated that there was "a growing feeling" that the Threshold Limit Value referred to in Union Carbide's Asbestos Toxicology Report was "no longer

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[83] Dernehl and Lane, Asbestos Toxicology Report, (1964) (produced by Union Carbide).

[84] Industrial Medicine and Toxicology Department, Union Carbide Corporation, Asbestos Toxicology Report, (May 5, 1969) (produced by Union Carbide).

[85] Sayers, Ian, Memorandum, Asbestos as a Health Hazard in the United Kingdom, (Dec. 1967) (produced by Union Carbide Corp.).

tenable."[86] Sayers also observed that mesothelioma "can occur in people with minimal fibrosis, *i.e.* only after a brief exposure, which may be as little as three months. Some authorities even believe that a single brief exposure might be sufficient."[87]

64. Mr. Sayers' visit to the library led him to conclude, among other things, asbestos caused asbestosis, mesothelioma and lung cancer and the TLVs for asbestos did not prevent disease, and the TLV for asbestos was, in fact, "an arbitrary choice, and had no experimental foundation." Sayers also recognized the "moral issue" surrounding the need to warn customers and others about the hazards:

> Moral Issues . . . on the basis of the present evidence, we are not entitled under any circumstances to state that our material [chrysotile asbestos] is not a health hazard. What is more, if it is believed that a potential customer would use our material 'dangerously', and that he is unaware of the toxicity question, then it must surely be our duty to caution him and to point out means whereby he can hold the asbestos air float to a minimum.

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[86] Sayers, Ian, Memorandum, Asbestos as a Health Hazard in the United Kingdom, (Dec. 1967) (produced by Union Carbide Corp.).

[87] Sayers, Ian, Memorandum, Asbestos as a Health Hazard in the United Kingdom, (Dec. 1967) (produced by Union Carbide Corp.); NIOSH, Revised Recommended Asbestos Standard, DWEW (NIOSH) Publication No. 77-169 (December 1976).

65. Sayers also was aware that of the opinion, expressed at the 1964 Conference on the Biological Effects of Asbestos, that "[t]he M.A.C. (Maximum Allowable Concentration) of 5 million particles per cubic foot is not now acceptable. Industry should aim at 1 million particles, and accept this figure with reservations until our knowledge in this field is extended."[88] On the basis of the foregoing, Sayers observed "[i]t thus appears that the sentence in Dr. Dernehl's Asbestos Toxicology Report: "It is now generally accepted that a man can work a 40-hour week for a lifetime without developing asbestosis, if the asbestos dust particle count is kept at or below 5 million particles per cubic foot of air is now no longer held to be true by a number of informed people."[89] Union Carbide's medical director, Dr. Carl Dernehl, agreed, stating that Sayer's memorandum was "reasonably accurate."[90]

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[88] Sayers, Ian, Memorandum, Asbestos as a Health Hazard in the United Kingdom, (Dec. 1967) (produced by Union Carbide Corp.).

[89] Sayers, Ian, Memorandum, *Asbestos as a Health Hazard in the United Kingdom*, (Dec. 1967) (produced by Union Carbide Corp.).

[90] Dernehl, Carl, Memorandum to Dr. T. J. Hall, [No Title] (June 7, 1967) (produced by Union Carbide Corp.). In this memoranda, the author points out that testing at the Mellon Institute revealed that Union Carbide's asbestos produced "the most severe reaction" in animal tests and "that it may be possible that our Coalinga product may be more hazardous to use than long fiber asbestos." Significantly, despite wondering whether 1 MPPCF would protect against mesothelioma, Union Carbide continued – for some time after this memoranda – to recommend to its

66. It has been documented in medical and scientific literature, for many decades, that medically significant exposures to asbestos thousands of times above background levels may not be visible to the naked eye. Breathing visible dust, however, from products containing asbestos reflects asbestos exposures not only well above background levels but also above the highest historic TLV, 5 MPPCF of asbestos-containing dust, a level that is generally not visible to the naked eye.[91] According to one asbestos company, 5 million particles per cubic foot "is generally not visible in the average work area unless a beam of light causing a Tyndall effect is present" and that "[u]sually the dust concentration must be from 8 – 10 million particles per cubic foot before its presence is visible in average lighting conditions."[92] Other experts during the pre-OSHA period reported that concentrations had to exceed 10 MPPCF before they would be become visible in a factory setting:[93]

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customers that keeping exposure below 5 MPPCF would prevent disease.

[91] *See*, Johnson, A.S. *No Halfway Measures in Dust Control.* National Safety Review. Vol. 32, No. 3:17–18 (1935).

[92] Union Carbide Corp., "Calidria" Asbestos SG-130 and SG-210 for Tape Joint Compounds (October, 1968).

[93] Hemeon, W.C.L. Plant and Process Ventilation. The Industrial Press (1955).

TABLE 1-8

Sight-Perception Dust Scale

(Visible Dust Concentrations in Ordinary Air)

Lighting	Perspective	
	Short Distances (less than 10 to 15 ft)	Long Distances (30 to 300 ft)
	Concentration, Million Particles per cu ft	
Beam of sunlight, background relatively dark	less than 1 (see distance cited)	
Bright sunlight but no beam effect	10–20	3–5
Bright daylight "inside" illumination (i.e., interior but no direct sun)	10–20	5–10
Low intensity daylight	20–99	10–30
Blue artificial light (night)	100–200	75–100

67. The 5 MPPCF TLV was never intended to protect workers from the cancer hazards of asbestos.[94,95] Thus, if someone worked in the presence of visible dust from an asbestos-containing product, the environment was greatly in excess of the *TLV for asbestosis.*

68. The first national standards regarding asbestos exposure were promulgated by the Occupational Safety and Health Administration (OSHA) based on a conversion from the TLV for asbestosis. Thus, the first permissible exposure limit (PEL) was recognized as not protective against cancer. Furthermore, the PELs were never intended to

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[94] Schall, E.L. *Present Threshold Limit Value in the U.S.A. for Asbestos Dust: A Critique.* Ann. N.Y. Acad. Sci. 132 (1):316321 (1965).

[95] Stokinger, *International Threshold Limits Values – 1963.* Am. Indust. Hyg. Assoc. J. 25:5 469 – 474 (Sept. 1963) (stating "At present no threshold values for any carcinogen appear in the list of any country.").

be the maximum exposure "an employee may be exposed to without incurring the risk of adverse health effects."[96] Indeed, however, OSHA has made clear that even at the relatively low level of today's PEL (0.1 f/cc), the risk of asbestosis probably is eliminated and the risk of cancer is reduced but "a significant risk continues to exist."[97]

69. It is well established that take-home asbestos on workers' clothes, shoes, or hair can cause mesothelioma in household members living with the asbestos exposed worker.

70. These types of exposures and their resultant disease manifestations are outlined very effectively in the National Institute for Occupational Safety and Health Report to Congress on Workers' Home Contamination Study that was conducted under The Workers' Family Protection Act (29 U.S.C. § 671a).[98] In this report NIOSH concludes that:

> families of asbestos-exposed workers have been at increased risk of pleural, pericardial, or peritoneal mesothelioma, lung cancer.

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[96] Letter from OSHA (Dir. Of Compliance Programs, Richard Fairfax) to Ellman (May 13, 1999). See also 59 FR No. 153 at pg. 40966-7 (August 10, 1994).

[97] Letter from OSHA (Dir. Of Compliance programs, Richard Fairfax) to Ellman (May 13, 1999).

[98] National Institute of Occupation Safety & Health ("NIOSH"). Report to Congress on Workers' Home Contamination Study Conducted Under the Workers' Family Protection Act (29 U.S.C. 671a) (Sept. 1995) at 6–11, 45–46, 55, 62–63, 86–87, 145–59 tbls.2–6.

cancer of the gastrointestinal tract, and non-malignant pleural and parenchymal abnormalities as well as asbestosis.

71. It has been repeatedly and consistently demonstrated in the medical and scientific literature that family members exposed to asbestos dust from laundering a worker's clothing have a significantly increased risk of developing mesothelioma.[99]

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[99] Wagner, J.C., C.A. Sleggs et al. *Diffuse Pleural Mesothelioma and Asbestos Exposure in the North Western Cape Province.* Br. J. Ind. Med. 17 (4):260–271 (1960); Newhouse, Muriel L. and Hilda Thompson. *Mesothelioma of Pleura and Peritoneum Following Exposure to Asbestos in the London Area.* Br. J. Ind. Med. 22:261–269 (1965); Leiben, J. and H. Pistawka, *Mesothelioma and Asbestos Exposure.* Arch. Environ. Health. 14:559–566 (1967); Champion, P., *Two Cases of Malignant Mesothelioma after Exposure to Asbestos.* Am. Rev. Respir. Dis. 103 (6):821–826 (1971); Lillington, G.A., R.J. Jamplis and J.R. Differding, Letter, *Conjugal Malignant Mesothelioma.* N. Engl. J. Med. 291 (11):583–584 (1974); Greenberg, Morris and T.A. Lloyd Davies, *Mesothelioma Register 1967–1968.* Br. J. Ind. Med. 31 (2):91–104 (1974); Anderson, Henry A., Ruth Lilis et al., *Household-Contact Asbestos Neoplastic Risk.* N.Y. Acad. Sci. 271:311–323 (1976); Li, F.P., J. Lokich et al., *Familial Mesothelioma After Intense Asbestos Exposure at Home.* JAMA. 240(5):467 (1978); Vianna, Nicholas J. and Adele K. Polan, *Non-Occupational*

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72. The publically available data would allow non-scientists, who had reason to make simple efforts, to discover the hazards of asbestos and to warn about them. Over the years, I have learned many companies in the business of making, selling and/or using asbestos products knew what the ancient Greeks knew: working with asbestos can be deadly. More recently, in 1967, a salesman for Union Carbide's asbestos business in the United Kingdom learned everything a worker needed to know from a trip to the library.[100]

73. While many of these events took place many years ago, it has never been acceptable to cause injury to others through commerce. Indeed,

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Exposure to Asbestos and Malignant Mesothelioma in Women. Lancet. 311 (8 073):1061–1063 (1978); Epler, G.R., M.X. Fitzgerald et al., *Asbestos-Related Disease from Household Exposure.* Respiration. 39 (4):229–240 (1980); Tagnon, I., W.J. Blott et al., *Mesothelioma Associated with the Shipbuilding Industry in Coastal Virginia.* Cancer Res. 40 (11):3 875–3879 (1980); Hammar, S.P., D. Bockus et al., *Familial Mesothelioma: A Report of Two Families.* Hum. Pathol. 20 (2):107–112 (1989); Roggli, Victor, *Mineral Fiber Content of Lung Tissue in Patients with Environmental Exposures: Household Contacts vs. Building Occupants.* Ann. N.Y. Acad. Sci. 643:511–518 (1991); Schneider, Joaquim, Kurt Straif et al., *Pleural Malignant Mesothelioma and Household Exposure.* Review Envron. Health. 11:65–70 (1996); Roggli, Victor. *Malignant Mesothelioma in Women,* Anat. Pathol. Chapter 8, pp. 147–163 (1997); Hillerdal, G., *Mesothelioma: Cases Associated with Non-Occupational and Law Dose Exposures.* Occup. Environ. Med 56 (8):505–513 (1999); Dodson, R.F., *Quantitative Analysis of Asbestos Buron in Women with Mesothelioma.* Am. J. Ind. Med. 43(2):88–195 (2003).

[100] Sayers, Ian. Asbestos as a Health Hazard in the U.K. Memorandum, Union Carbide Corp. (1967).

industry, including the asbestos industry, understood the need to test products for safety *before* putting them on the market. For example, in 1942, the Industrial Hygiene Foundation published the presentation of Francis Holden, made at the Seventh Annual Meeting of the Industrial Hygiene Foundation of America, Inc., wherein the author discussed the need for responsible companies to test products for safety: "Every new chemical or product should be investigated as to its toxicity before it is prepared in large amounts and released to the public."[101] Companies involved in the asbestos trade and/or use of asbestos had numerous avenues for testing of products. Henry Field Smyth examined the need to research hazards of new chemicals to "prevent injury to the health of workmen" . . . and to what extent the health of the public is being protected in the matter of keeping unsuitable chemicals out of the preparations it can purchase for its own discussed his work at one such facility, known as the Mellon Institute of Industrial Research:

> The prevention of occupational disease requires that knowledge of the potential hazards of the materials handled by workmen shall be readily available to industrial physicians and industrial hygiene engineers. . . .

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[101] Holden, Francis. What the Foundation Plant Surveys Are Disclosing, Meeting Report, Seventh Annual Meeting of the Members, Pittsburgh, PA, p. 62 (November 10–11, 1942).

It is clearly the duty of every manufacturer to delay production of a chemical until the health hazards are well enough defined so that protection of his workmen is possible. It is also his duty not to sell a chemical for an application in which it would endanger the health of the public, and to inform customers, by proper labeling and otherwise, of the hazards of the compounds they buy. . . .

All producers of chemicals are probably aware of the problem which the flood of new materials presents to the industrial physicians and the hygienist. The matter is the responsibility of industry and in only rare instances is it proper to depend upon federal or state agencies to alleviate the situation. Several solutions have been evolved by single manufacturers and it is of interest to examine one of them in some detail. Eight years ago one firm established, at its own expense, an industrial fellowship under my direction at the Mellon Institute of Industrial Research of the University of Pittsburgh. The organization has grown steadily and we now have staff of 18 technically trained persons, and facilities to house about 3,500 animals, with further expansion visible in the near future.

By means of close contact with the research, production, and medical departments of this manufacturer our group is made aware of all new chemicals which it develops. . . .

> Upon all chemicals suspected of being potentially injurious to workmen or about which any doubt is entertained, we at once perform experiments designed to elucidate the situation. By means of tests upon small animals we investigate the hazard of swallowing, of skin penetration, of inhalation, of skin contact and of eye contact. . . .
>
> We refer to this procedure as a range finding test. It is performed in a short time and at a cost of only a few hundred dollars, and the results can be made known to the producer before the stage of pilot plant operation is reached. . . .
>
> After a time it may become apparent that the new material will be made and sold in larger quantities. Not until then is it appropriate to perform more detailed and expensive studies . . . which will reveal more precisely the quantitative hazards which must be guarded against in applications of the chemical, and the nature of the injury which overexposure may produce. When this evidence is published in the medical literature, our function is fulfilled in respect to the particular material, and the physician and hygienist are thus informed so that they can intelligently safeguard health.[102]

74. Responsible industry, beginning in the early twentieth century, began to undo the wrongs to

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[102] Smyth, Jr. Henry F. *Solving the Problems of the Toxicity of New Chemicals in Industry.* W.V. Med. J. 4:177–178 (1946).

workers and to stem the tide of occupational diseases. "It is management's responsibility to make sure that conditions are as safe as it is practicable to make them, and to insure that persons working with new compounds, processes and applications know the hazards involved and the precautions to be taken."[103] As one asbestos industry executive wrote in 1955:

> [t]o be sure, industry's awakening was a slow one. Fifty years ago a few leaders in industry attempted to improve the health and working conditions for employees. But it was just an attempt. The few efforts that were made were crude and isolated. And precious little financial support was offered. It is not surprising that progress was slow. Then the public's voice was heard. The public's growing concern for the health of the employee was forcibly brought to the attention of industry. There were just too many occupational diseases, too many tragedies in the mines, mills and factories. And to the great credit of industry, the problems were recognized.
>
> Industry no longer considered an employee mere chattel or commodity to be put on the block to be auctioned off to highest bidder. His dignity as a human being was being acknowledged.
>
> Public-spirited men of wealth endowed research institutions to probe into

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[103] Hine, C.H. and N. W. Jacobsen. *Safe Handling Procedures for Compounds Developed by the Petro-Chemical Industry*, Ind. Hyg. Quarterly. 15 (2):141–144 (1954).

occupational hazards and diseases and to develop methods and procedures to improve the health of the individual, of the employee in industry, and conditions in the community.

Progressive-minded companies established medical clinics. They pushed ahead with health and safety programs. The programs were, and still are, based on taking care of the physical and mental well being of employees, helping and protecting the consumer and promoting the common good.[104]

75. By 1955, the "typical" health and safety program included medical surveillance of workers, control of occupational hazards, on the job medical care, safety precautions and plant "medical, industrial hygiene and safety personnel coordinated by a headquarters health department."[105]

76. By the first half of the twentieth century, industry was "also aware of [its] responsibility to the consuming public. Today, the products of industry are designed to promote health and comfort of the public. . . . Today our industrial research organizations probe every health hazard. . . . [E]very effort is made nowadays to protect the consumer with safer products and better methods of handling them. And every safeguard is insisted upon before the product is

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[104] Fisher, A. R. The Economics of Industrial Health, Twentieth Annual Meeting, Industrial Hygiene Foundation, Transactions Bulletin No. 29, p. 15 (November 16–17, 1955).

[105] Fisher, A. R. The Economics of Industrial Health, Twentieth Annual Meeting, Industrial Hygiene Foundation, Transactions Bulletin No. 29, p. 16 (November 16–17, 1955).

marketed to the consumer."[106] Industry recognized that the obligation was to the employee, the users of products and also to protect the families of employees: "the employee's health is better, his morale is higher. He and his family live longer and more happily."[107]

77. Significantly, by the 1940s, industry was well aware of the need to warn anyone and everyone who might be exposed to a risk of harm. The Manufacturing Chemists Association (MCA) issued guidelines for how to appropriately warn users and purchasers of hazardous products.[108] The MCA, through its members, recognized that the best way to warn end users of chemicals was to label the hazardous materials. The MCA recognized the "need for furnishing the appropriate information in those cases were [the product at issue presents] hazards requiring special precautions. Precautionary information should, so far as practicable, reach every person using, handling, or storing hazardous

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[106] Fisher, A. R. The Economics of Industrial Health, Twentieth Annual Meeting, Industrial Hygiene Foundation, Transactions Bulletin No. 29, p. 17 (November l 6–17, 1955.

[107] Fisher, A. R. The Economics of Industrial Health, Twentieth Annual Meeting, Industrial Hygiene Foundation, Transactions Bulletin No. 29, p. 18 (November 16–17, 1955).

[108] Manufacturing Chemists Association, A Guide for the Preparation of Warning Labels for Hazardous Chemicals, Manual L-1 (1942).

substances."[109] As the National Paint, Varnish and Lacquer Association observed in 1939, "[t]he manufacturer or one who holds himself out to be a manufacturer must know the qualities of his product and he cannot escape liability on the ground that he did not know it was dangerous."[110] The MCA warning guidelines were well known to industry in the 1940s, as illustrated by this entry in the IHF's annual report:

> It is of primary importance that there be uniformity in labeling hazardous chemicals so that the exact type and degree of danger will be presented. The Manufacturing Chemists' Association Manuals L-1 and L-2 provide guidance. For mixtures, only the dangerous constituents need he mentioned. Under no circumstances should chemicals be over-labeled, i.e., the degree of hazard should not be exaggerated.[111]

78. Indeed, responsible "industry inspired, to a very great extent, the movement to label properly

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[109] Manufacturing Chemists Association, A Guide for the Preparation of Warning Labels for Hazardous Chemicals, Manual L-1 (6th Ed. I 961) at page 7.

[110] National Paint, Varnish and Lacquer Association, Inc., Memorandum Regarding Manufacturing Chemists Association Legal Principles (1939).

[111] Smyth et al., Summary on Conference of Chemistry and Toxicology, Eleventh Annual Meeting of Foundation Members, Transactions Bulletin No. 8 (1946).

certain types of products that might harm the consumer if he were not forewarned."[112]

79. By 1957 the MCA's guidelines regarding warnings were so widely known that anyone providing materials to the United States Navy was required, by military specifications, to include warnings based on Manual L-1.[113]

80. Even before the Navy expressly adopted the MCA's guidelines on warnings, adequate warnings were expected. The Navy regulations[114] included the following regulation:

> 7.8 REGULATION AND STATUTE MARKING.
>
> Special handling instructions and warnings shall be shown as required by the Interstate Commerce Commission regulations, U.S. Coast Guard regulations, Civil Aeronautics Board publications, and by statute.

81. In 1972, using essentially the identical guidelines published first in the 1940s, the MCA issued a proposed asbestos warning as follows:

> WARNING ! HARMFUL IF INHALED MAY CAUSE DELAYED LUNG INJURY (ASBESTOSIS, LUNG CANCER)

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[112] Fisher, A. R., The Economics of Industrial Health, Twentieth Annual Meeting, Industrial Hygiene Foundation, Transactions Bulletin No. 29, p. 17 (November 16–17, 1955).

[113] MIL-STD-1298 (1957) incorporated the MCA Manu al L-1, *A Guide for Preparation of Warning Labels for Hazardous Chemicals.*

[114] MIL-STD-129A (1954).

Do not breathe dust.

Use only with adequate exhaust ventilation or approved respiratory protective devices.

Remove dust and fibers from clothing only by vacuum cleaning. Clean work areas only with vacuum cleaners or wet cleaning methods."[115]

82. Despite the fact that guidelines were available, many companies included cautions that did not adequately inform the consumer. For example, Union Carbide, an asbestos mining and milling company, claims to have begun placing the following warning on its bags of asbestos: "WARNING - Breathing Asbestos Dust May Be Harmful. Do not breathe dust."[116] This warning was described as "the most innocuous warning [Union Carbide] could devise." This "innocuous" warning led the person in charge of Union Carbide's asbestos business to conclude that Union Carbide asbestos was as dangerous as being behind a plow in a very dry weather.[117]

83. All of the information above, with the exception of a few of the internal documents, was readily available to any company that cared to investigate the hazards of asbestos. As part of membership in the Industrial Hygiene Foundation (IHF), the National Safety Council (NSC), the American Ceramic Society (ACS), the

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[115] Best, George, Manufacturing Chemists Association Letter to Director Scannell. OSHA (March 15, 1972).

[116] Gould, Memorandum re King City - Asbestos Multiwall Bag Specifications (July 11, 1969)(produced by Union Carbide).

[117] Myers Deposition (April 9, 1982) at p. 62:20–24.

American Society of Mechanical Engineers (ASME), the Illinois Manufacturers Association (IMA), and the Asbestos Information Association/North America (AIA/NA) members received regular copies of those organizations' periodicals. Because these organizations, and many other industry-focused groups, published on medical, industrial hygiene and safety issues, members of these organizations actually received information about the hazards of asbestos.

84. The IHF, for example, regularly distributed abstracts – summaries of national and international medical, industrial hygiene and safety literature – beginning in the 1930s.[118] The IHF Digests summarized more than one hundred articles – from all over the world – detailing the hazards of asbestos. The IMA, a Chicago-based trade organization, was well aware of the hazards of asbestos in the 1930s and worked to shape the law of Illinois to reduce legal liability of its members resulting from occupational exposure to asbestos and silica. [119] Because asbestos disease and silicosis were so important to industrial concerns in the United States, organizations like

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[118] Air Hygiene Foundation of America. Inc., Officers, Committees, Member's and Purposes, information Circular No. 8 (1938) (stating that the organization "[p]rovides monthly abstracts summarizing current literature on occupational health subjects. This is an important labor-saver for company officials. Further, it insures executives against missing vital new developments."

[119] Industrial Review, Occupational Diseases, Heath, Comfort and Safety and Changes in the Blower Act, 9:105 (February, 1936).

the IMA routinely discussed these matters with their members.[120]

85. ASME's monthly publication, *Mechanical Engineering*, published numerous articles about asbestos and health before 1940.[121] ASME is one of the largest, most popular engineering societies.

86. Given the abundant information available to industry since the early twentieth century, that asbestos could cause disabling and fatal diseases, and including cancer since 1942, it is my opinion companies involved in commerce should have, at a minimum, been warning that asbestos could cause cancer and other asbestos-related disease.

Product Defense Literature - Sometimes Called "Doubt Science" Published to Aid in the Defense of Lawsuits and Limit Regulation

87. The earliest evidence of the creation of evidence to aid in the defense of asbestos lawsuits - "Doubt Science" - can be traced back to the 1930s. In 1935, The Temporary Organizing Committee for the Industrial Dust Problem (which ultimately

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[120] *E.g.*, Industrial Review, Book III on Silicosis, 10:118 (November, 1938) (discussing the IMA's receipt of The Pneumonokonioses (Silicosis) – Literature and Laws, Volume III and stating "[t]he work is invaluable to any industrial concern or professional authority dealing with silicosis.").

[121] *E.g.*, Willson, Frederick, *Dust Industry – Shop Methods and Equipment Effective in Controlling Dust Hazards*. Mech. Eng. 55:2 (1933); Dallavalle, J.M, *The Control of Industrial Dust – The Problem of Local Exhaust and General Ventilation*. Mech. Eng. 55:10 (October, 1933); Sayer, H.D. *Occupational Disease – Additional Responsibility Legislation Places on Industry*. Mech. Eng. 60:2 (1938).

led to the formation of the Industrial Hygiene Foundation) proposed that a group of companies with asbestos and silica dust "problems" work to set up "authoritative and approved standards for the control of industrial dusts which, if complied with by industries, or by industrial companies, will act as a defense against personal injury suits."[122] This memorandum from 1935 was a discussion of the origin of what later became known as the Threshold Limit Value ("TLV").

88. By 1973, the asbestos industry was privately admitting what they knew or should have known for many years: asbestos was a killer. For example, the AIA/NA secretary, Matthew Swetonic, wrote in a speech to the Asbestos Textile Institute "there is no doubt that the inhalation of substantial amounts of asbestos can lead to increased rates of various types of lung disease, including two forms of cancer. These are facts which cannot be denied, even if they do not apply in all circumstances and under all conditions."[123]

89. The speech, *Why Asbestos?*, provides insight into the mindset of asbestos companies in the asbestos industry. Mr. Swetonic, who later served as a public relations representative for the tobacco industry, explained the industry position:

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[122] Letter from E. R. Weidlein (Director of Mellon Institute) to Roger A. Hitchins (President, American Refractories Institute) (January 21, 1935).

[123] Swetonic, Why Asbestos – A Speech Before the Asbestos Textile Institute Arlington, Virginia, June 7, 1973, (produced by Union Carbide).

> In our original concept, the Association would limit its activities to providing accurate, unbiased information on asbestos and health to the press, to the public and to interested politicians and other government officials.
>
> Fortunately — and properly — the Association has had the wisdom to alter its original limited concept. Of its proper functions, and now endeavors to assume whatever activities and responsibilities it deems necessary to protect the interests of the asbestos manufacturing industry in the United States vis-à-vis asbestos health."[124]

90. The AIA/NA published numerous pamphlets aimed at providing some information to inform workers of the hazards, but those materials sought to downplay the hazards of asbestos and to create a false sense of security on the part of the employer that asbestos could be used safely with minimal effort.

91. Some aspects of the approach set forth in Swetonic's speech continue to this day. In efforts to avoid responsibility in court and to enable continued commerce in asbestos around the world, the asbestos industry has sought to cast doubt on the hazards of asbestos. Industry. and their lawyers have employed a steady stream of

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[124] Swetonic, Why Asbestos – A Speech Before the Asbestos Textile Institute, Arlington, Virginia, June 7, 1973, (produced by Union Carbide).

"Doubt Scientists" who publish Product Defense literature in industry-friendly journals.[125] [126]

92. Using tactics that closely resemble those used by the tobacco industry, the asbestos industry "continues to generate endless debate on the relative hazards of asbestos or different fiber type and dimension. In these debates industry spokespersons argue that some forms of asbestos are less harmful than others. However, epidemiological and statistical efforts to characterize relative cancer potencies for different asbestos fiber types and for fibers of different sizes have not been able to overcome limitations or the exposure data. Nor can these analyses account for the fact that in the real world exposure is almost always to mixtures of asbestos fibers of different types and sizes."[127]

93. In an effort to defeat liability claims, "the asbestos industry is to commission the publication of articles, primarily in toxicology journals, termed "product defense" articles. These articles are frequently sponsored by asbestos interests such as the defendants in personal injury asbestos litigation. They are distinguished from other science papers in that

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[125] Michaels, *Doubt is their product. How industry's assault on science threatens your health.* New York: Oxford University Press (2008).

[126] Michaels. *Manufactured uncertainty: Protecting public health in the age of contested science and product defense.* Ann NY Acad Sci 1076; 149 – 162 (2006)

[127] Collegium Ramazzini, *Asbestos Is Still With Us: Repeat Call for a Universal Ban.* Am. J. Indust. Med. 54:168–173 (2011).

they are written by scientific consultants and consulting firms, who are paid substantial sums for their work.[128] All together, the Auto Industry, including Ford Motor Company, General Motors, Chrysler, Borg Warner and Honeywell, Inc. have paid tens of millions of dollars to employ expert witnesses to publish articles for use in product defense.[129]

94. More recently, Georgia Pacific LLC and other companies that made and sold asbestos-containing joint compounds have funded a series of articles, orchestrated and controlled by lawyers, in an effort to create a product defense. The role of lawyers and the legal department in creating these Product Defense articles was not disclosed and the failure to disclose these potential conflicts of interest was improper. The New York Supreme Court Appellate Division described the studies as follows:

> GP funded these studies in 2005 to aid in its defense of asbestos-related lawsuits. The studies were performed by experts from various organizations, who, among other things, recreated GP's historical joint compound product for the purpose of testing its biopersistence and pathogenicity. To

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[128] Collegium Ramazzini, *Asbestos Is Still With Us: Repeat Call for a Universal Ban*. Am. J. Indust. Med. 54:168–173 (2011).

[129] LaDou et al., *The Case for a Global Ban on Asbestos*. Environ. Health Perspectives 118:7 (July, 2010) (indicating GM, Ford and Chrysler sponsored several paper written by product defense consultants and "paid almost $37 million between 2001 and 2008" for various services relating to the articles).

facilitate the endeavor, GP entered into a special employment relationship with Stewart Holm, its Director of Toxicology and Chemical Management, to perform expert consulting services under the auspices of its in-house counsel, who also was significantly involved in the pre-publication review process.

...

Holm co-authorized nearly all of the studies, which were intended to cast doubt on the capability of chrysotile asbestos to cause cancer. On the two articles that he did not coauthor, he and GP's counsel participated in lengthy "WebEx conferences" in which they discussed the manuscripts and suggested revisions. Despite this extensive participation, none of the articles disclosed that GP's in-house counsel had reviewed the manuscripts before they were submitted for publication. Two articles falsely stated that "[GP] did not participate in the design of the study, analysis of the data, or preparation of the manuscript." For articles lead-authored by David M. Bernstein, Ph.D., and co-authored by Holm, the only disclosure was that the research was "sponsored" or "supported" by a grant from GP. The articles did not disclose that Holm was specially employed by GP for the asbestos litigation or that he reported to GP's in-house counsel. Furthermore, there were no grant proposals, and Dr. Bernstein was hired by GP on an hourly basis. Nor did the articles reveal that Dr. Bernstein has been disclosed as a GP

> expert witness in NYCAL since 2009, that he had testified as a defense expert for Union Carbide Corporation in asbestos litigation, or that he had been paid by, and spoken on behalf of, the Chrysotile Institute, the lobbying arm of the Quebec chrysotile mining industry. Although GP belatedly endeavored to address the inadequacies of certain of its disclosures, its corrections failed to acknowledge its in-house counsel's participation and did not make clear that Dr. Bernstein's testimony as an expert witness preceded the publication of the first GP reformulated joint compound article in 2008.
>
> The foregoing constitutes a sufficient factual basis for a finding that the relevant communications could have been in furtherance of a fraud, and the motion court properly confirmed the recommendation directing in camera review of the internal documents. As the court remarked, it is of concern that GP's in-house counsel would be so intimately involved in supposedly objective scientific studies, especially in light of GP's disclosures denying such participation.[130]

The New York court described the consultants' work as "seeding of the scientific literature with

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[130] *Matter of New York City Asbestos Litigation*, 2013 NY Slip Op 04127 (First Judicial Department, Decided June 6, 2013) (legal citations omitted).

GP-funded studies."[131] A list of the GP-funded studies follows:

- Brorby, Sheehan, Berman, Greene and Holm, *Re-Creation of Historical Chrysotile-Containing Joint Compounds*, INHALATION TOXICOLOGY, 20:1043-1053 (2008);
- Bernstein, Donaldson, Decker, Gaering, Kunzendorf, Chevalier and Holm, *A Biopersistence Study following Exposure to Chrysotile Asbestos Alone or in Combination with Fine Particles*, INHALATION TOXICOLOGY, 20:1009-1028 (2008);
- Bernstein, Rogers, Sepulveda, Donaldson, Schuler, Gaering, Kunzendorf, Chevalier and Holm, *The Pathological Response and Fate in the Lung and Pleura of Chrysotile in Combination with Fine Particles Compared to Amosite Asbestos Following Short-Term Inhalation Exposure: Interim Results*, INHALATION TOXICOLOGY, 22(11): 937-962 (2010);
- Bernstein, Rogers, Sepulveda, Donaldson, Schuler, Gaering, Kunzendorf, Chevalier and Holm, *Quantification of the Pathological Response and Fate in the Lung and Pleura of Chrysotile in Combination with Fine Particles Compared to Amosite-Asbestos Following*

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[131] *Matter of New York City Asbestos Litigation*, 2013 NY Slip Op 04127 (First Judicial Department, Decided June 6, 2013).

Short-Term Inhalation Exposure, INHALATION TOXICOLOGY, 23(7): 372–391 (2011);

- Brorby, Sheehan, Berman, Bogen and Holm, *Potential Artifacts Associated with Historical Preparation of Joint Compound Samples and Reported Airborne Asbestos Concentrations*, J. OCCUP. AND ENVIRON. HYG., 8: 271–278 (2011);
- Sheehan, Brorby, Berman, Bogen and Holm, *Chamber for Testing Asbestos-Containing Products: Validation and Testing of a Re-Created Chrysotile-Containing Joint Compound*, ANN. OCCUP. HYG., 55(7) 797–809 (2011);
- Simmons, Jones and Boelter, *Factors Influencing Dust Exposure: Finishing Activities in Drywall Construction*, J. OCCUP. AND ENVIRON. HYG., 8: 324–336 (2011);
- Jones, Simmons and Boelter, *Development and Evaluation of a Semi-Empirical Two Zone Dust Exposure Model for a Dusty Construction Trade*, J. OCCUP. AND ENVIRON. HYG., 8: 337–348 (2011);
- Jones, Simmons & Boelter, *Comparing Two-Zone Models of Dust Exposure*, J. OCCUP. AND ENVIRON. HYG., 8: 513–519 (2011);
- Berman, Brorby, Sheehan, Bogen and Holm, *More on the Dynamics of Dust Generation: The Effects of Mixing and Sanding Chrysotile, Calcium Carbonate,*

and Other Components on the Characteristics of Joint-Compound Dusts, ANN. OCCUP. HYG., 56(7):852–867 (2012);

- Brorby, Sheehan, Berman, Bogen and Holm, *Exposures from Chrysotile-Containing Joint Compound: Evaluation of New Model Relating Respirable Dust to Fiber Concentrations*, RISK ANALYSIS (2012).

Testimony of Mr. Holm, the in-house Georgia Pacific, LLC scientist working for the legal department, confirmed that the Product Defense consultants who authored the above-mentioned articles were paid in excess of $7,800,000.[132] It appears that there we no "grants" and that the payments were fee-for-service arrangements.

95. Recently, it has come to light that two other articles by David Bernstein – also claiming to have been financed by a purported " grant" from asbestos litigation defendant Union Carbide nearly two decades after Union Carbide exited the asbestos mining and milling business – were the subject of extensive, secret lawyer communications between lawyers for Union Carbide and Bernstein.[133] Union Carbide,

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[132] Holm Deposition (June 6, 2011) at 196:1 – 199:25.

[133] Union Carbide Privilege Log, *In re New York City Asbestos Litigation All Weitz & Luxenberg Cases in which Union Carbide Corporation is a Defendant*, Supreme Court of the State of New York (before the Hon. Sherry Klein Heitler) Index No. 40000/8 (2013). There are dozens of entries indicating the Dr. Bernstein discussed the published papers on Union Carbide's asbestos with lawyers for Union Carbide prior to publication.

through its attorneys, paid Dr. Bernstein and his co-authors "approximately $400,623.20."[134]

96. Phelka & Finley, ***Potential health hazards associated with exposures to asbestos- containing drywall accessory products: A state-of the-science assessment***, CRITICAL REVIEWS IN TOXICOLOGY, 42(1): 1–27 (2012) was funded by Kaiser Gypsum, another asbestos defendant.

97. McCoy et al, ***Mesothelioma in Drywall Finishing Workers***, Journal of ASTM Intern. Vol. 8 No.1 (2011) was written by Kim Anderson, a consultant to asbestos defendants who made and/or sold asbestos joint compounds, but the conflict was not disclosed. John Dement — whose data were used by McCoy, et al. — wrote that McCoy et al. used his data in an "unscientific and misleading manner."[135] Furthermore, Dement and Lipscomb wrote that McCoy, et al. summary is totally misleading, and their interpretation of our study is scientifically inappropriate."[136] In conclusion, Dement and Lipscomb wrote "[t]he

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[134] Defendant Union Carbide Corporation's Response to Plaintiff's Interrogatories, *Legault v. Bayer Cropscience, Inc., et al.* In the Circuit Court of the 13th Judicial Circuit in and for Hillsborough County, Florida (May 9, 2012).

[135] Dement and Lipscomb, ***Discussion on "Mesothelioma in Drywall Finishing Workers,"*** by McCoy, M. J. Wolter, M. E., and Anderson, K. E, [Journal of ASTM International Vol. 8, No. 1 (2011), Paper ID JA1102786] (May, 2012).

[136] Dement and Lipscomb, ***Discussion on Mesothelioma in Drywall Finishing Workers,"*** by McCoy, M. J., Wolter, M. E., and Anderson, K. E. [Journal of ASTM International Vol. 8, No. 1 (2011), Paper 10 JA1102786] (May, 2012).

public health and environmental literature are increasingly inundated with publications whose major purpose is to create doubt and uncertainty in an effort to oppose regulations or support tort litigation. While honest scientific disagreement and debate are useful, the McCoy et al. publication and the response by Anderson appear more directed at manufacturing uncertainty rather than a balanced review and presentation of the scientific literature."[137]

98. Recently, David Bernstein and others published another Doubt Science piece that misleadingly claims was supported by a "grant" from an industry trade organization.[138] This article contains several unsupported conclusions and glaring errors which, given the misleading funding disclosure, suggest that bias may have played a role in shaping the conclusions. Additionally, documents disclosed in litigation indicate that the article was written completely by Dr. Bernstein and Dr. Dunnigan and that they were planning to recruit additional "prospective co-authors worldwide" to add their names and "acceptance of co-authorship." One of the co-authors, Allen Gibbs, added his name after the

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[137] Dement and Lipscomb, *Discussion on Mesothelioma in Drywall Finishing Workers*," by McCoy, M. J., Wolter, M. E., and Anderson, K. E. [Journal of ASTM International Vol, 8, No. 1 (2011), Paper ID JA1102786] (May, 2012) (citing Michaels et al., *Manufacturing Uncertainty: Contested Science and the Protection of the Public's Health and Environment*. J. Public Health, Vol. 95,2005, pp. S39–S48).

[138] Bernstein et al., *Health risk of chrysotile revisited*. Crit. Rev. Toxicol. 43(2) 154–183 (2013).

"several (6) drafts" mentioned below and testified as follows:

> Q. How many hours did you spend working on this paper?
>
> A. It's quite a long paper, so there was quite a lot to read. Probably five or six hours.

Dr. Gibbs claims to have contributed to the section on asbestos exposure at the GARCO facility in South Carolina, but admitted that section contained serious errors. Essentially, Dr. Bernstein and Dr. Gibbs attempt to blame the mesothelioma cases in workers from an asbestos textile facility on asbestos wafting over from the Navy Yards. Specifically, Gibbs admits there is a "major problem with [his] theory." When questioned on the inaccuracies, Dr. Gibbs appeared to be unwilling to commit to correcting the serious errors:

> Q. Sir, don't you think that the misrepresentations in the paper should be corrected for the record'?
>
> A. Possibly, yes.

To date, I am unaware of any such corrections being made.

Substantial Epidemiological Data Supports the Consensus that All Types of Asbestos Can Cause Mesothelioma in Humans

99. In addition to these consensus documents from national and international agencies, numerous peer-reviewed epidemiological studies, meta-analyses, reviews and reports also conclude that

chrysotile asbestos causes mesothelioma.[139] Lemen provides an excellent summary of some of

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[139] Kanarek, *Mesothelioma from Chrysotile Asbestos: Update*, AEP Vol. 21, No. 9, pp. 688–97 (2011); Henley, S.J. et al., *Mesothelioma incidence in 50 states and the District of Columbia, United States*, 2003 – 2008. Int. J. Occup. Environ Health Vol. 19; 1 – 10 (2013); Elliott et al., *Lung cancer mortality in North Carolina and South Carolina chrysotile asbestos textile workers*. Occup. Environ. Med. 10.1136 (2012); Li et al., *Cohort studies on cancer mortality among workers exposed only to chrysotile asbestos: a meta-analysis*. Biomed. Environ. Sci. 17(4):459–468 (2004); Loomis et al., *Lung cancer mortality and fibre exposures among North Carolina asbestos textile workers*. Occup. Environ. Med. 66:535–542 (2009); Hein et al., *Follow-up study of chrysotile textile workers: Cohort mortality and exposure-response*. Occup. Environ, Med. 64:616–625 (2007); Silverstein et al., *Developments in asbestos cancer risk assessment*. Am. J. Ind. Med. 52:850–858 (2009); Finkelstein et al., *Mesothelioma among employees of a Connecticut factory that manufactured friction materials using chrysotile asbestos*. Ann. Occup. Hyg. 54:692–696 (2010); Egilman et al., *A case of occupational peritoneal mesothelioma from exposure to tremolite-free chrysotile in Quebec, Canada: A black swan case*. Am. J. Ind. Med. 54:153–156 (2011); Pira et al., *Mortality from cancer and oilier causes in the Balangero cohort of chrysotile asbestos miners*. Occup. Environ, Med. 66:805–809 (2009); Mirabelli et al., *Excess of mesotheliomas after exposure to chrysotile in Balangero, Italy*. Occup. Environ. Med. 65:815–819 (2008); Turci et al., *Role of associated mineral fibres in chrysotile asbestos health effects: The case of Balangeroite*. Ann. Occup. Hyg.; 53:491–497 (2009); Everatt et al., *Occupational asbestos exposure among respiratory cancer patients in Lithuania*. Am. J. Ind. Med. 50:455–463 (2007); Madkour et al., *Environmental exposure to asbestos-response relationship with mesothelioma*. Eastern Mediterranean Health J. 15:25–38 (2009); Yano et al., *Mesothelioma in a worker who spun chrysotile asbestos at home during childhood*. Am. J. Ind. Med.;52:282–287 (2009); Baumann et al., *Pleural mesothelioma in New Caledonia: An acute environmental concern*. Cancer Detect Prev. 31:70–76 (2007); Baumann et al., *Pleural*

the most important epidemiological evidence regarding asbestos.[140]

100. The epidemiological evidence that all forms of asbestos cause human malignant mesothelioma is so convincing that a consortium of epidemiologic and public health groups recently came together to issue the following position statement:

> A rigorous review of the epidemiologic evidence confirms that all types of asbestos fibre are causally implicated in the

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mesothelioma in New Caledonia: Associations with environmental risk factors. Environ. Health Perspect. 119:695–700 (2011); Nishikawa et al., *Recent mortality from mesothelioma, historical patterns of asbestos use, and adoption of bans: A global assessment*. Environ. Health Perspect. 116;1675–1680 (2008); Welch et al., *Asbestos and peritoneal mesothelioma among college-educated men*. Int. J. Occup. Environ. Health., 11: 254–258 (2005); Lemen, *Asbestos in brakes: exposure and risk of disease*. Am. J. Ind. Med, 2004; 45(3):229–237 (2004); Frank et al., *Carcinogenic implications of the lack of tremolite in UICC reference chrysotile*. Am. J. Ind. Med. 34(4):314–317 (1998); Smith et al., *Chrysotile asbestos is the main cruse of pleural mesothelioma*. Am. J. Ind. Med. 30:252–266 (1996); Cullen, *Chrysotile asbestos: enough is enough*. Lancet. 351(9113):1377–1378 (1998); Landrigan et al., *The hazards of chrysotile asbestos: a critical review*. Ind. Health 37(3):271–280 (1999); Landrigan et al., *Collegium Ramazzini call for an international ban on asbestos*. Am. J. Ind. Med. 47(6):471–474 (2005); Stayner et al., *Occupational exposure to chrysotile asbestos and cancer risk: a review of the amphibole hypothesis*. Am. J. Public Health 86:179–186(1996).

[140] Lemen, Asbestos: Risk Assessment, Epidemiology, and Health Effects. 2d Ed., Chapter 5, *Epidemiology of Asbestos-Related Diseases and the Knowledge that Led to What is Known Today*, pages 131 – 267, Boca Raton: Taylor and Francis (2011).

> development of various diseases and premature death. Numerous well-respected international and national scientific organizations, through an impartial and rigorous process of deliberation and evaluation, have concluded that all forms of asbestos are capable of inducing mesothelioma, lung cancer, asbestosis and other diseases. These conclusions are based on the full body of evidence, including the epidemiology, toxicology, industrial hygiene, biology, pathology, and other related literature published to the time of the respective evaluations. . . .
>
> [A]n Italian chrysotile mining cohort in Balangero, Italy, has been followed up over the years (Piolatto, 1990; Mirabelli, 2008) and has demonstrated a statistically significant four-fold excess (6 cases vs. 1.5 expected) of pleural mesothelioma among blue-collar workers, and also among other classes of workers as well as among allied workers (Mirabelli, 2008). The chrysotile mined at Balangero was reported to be free of tremolite and other amphiboles).[141]

This position was endorsed by at least eight mainstream professional organizations, including the American College of Epidemiology, the American Public Health Association and the

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[141] Position Statement on Asbestos from the Joint Policy Committee of the Societies of Epidemiology (JPC-SE) June 4, 2012.

Canadian Society for Epidemiology and Biostatistics.

101. Prior risk assessments looking at the potency of the various fiber types used unreliable and incomplete data about exposures and thus yielded unreliable data. A recent meta-analysis, using only epidemiological studies with more reliable data, yielded results which show that chrysotile is much more potent for causing mesothelioma than previously believed."[142] These authors recognize that "[a]sbestos is a well-known carcinogen responsible for cancer of the pleura and peritoneum (mesothelioma) and lung cancer. The profound consequence of historical exposure to asbestos is well documented in many countries. *Id.* (citing Lin et al., 2007).[143] Using the more accurate measurements, the authors of this risk assessment recommended lowering the exposure limit to 0.002 f/cc or 2% of the current PEL (0.1 f/cc) set by OSHA in the United States.

102. IARC's recent update on the carcinogenicity of asbestos points out the weaknesses, limitations

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[142] Burdorf et al., *Applying Quality Criteria to Exposure in Asbestos Epidemiology Increases the Estimated Risk.* Ann. Occup. Hyg., Vol. 55, No. 6, pp. 565–568 (2011) (discussing Gezondheidsraad, Asbestos—risks of environmental and occupational exposure, The Hague, the Netherlands: Health Council of the Netherlands, report 2010/10E (2010). Available at www.gezondheidsraad.nl/en/publications/asbestos-risks-environmental-and-occupational-exposure. Accessed March 28, 2012).

[143] Lin et al., *Ecological association between asbestos-related diseases and historical asbestos consumption: an international analysis.* Lancet, 369: 844–9 (2007).

and incomplete nature of two risk assessments, Berman & Crump (2003 and 2008) and Hodgson & Darnton (2000), that suggested large potency differences between amphibole forms of asbestos and chrysotile.[144] IARC pointed out that neither Berman et al. (2003 and 2008) nor Hodgson et al, (2000) considered the important data on chrysotile potency data from Loomis et al. (200) and Mirabelli et al. (2008). IARC also noted that "there is a high degree of uncertainty concerning the accuracy of the relative potency estimates derived from the Hodgson & Darnton and Berman & Crump analyses because of the severe potential for exposure misclassification in these studies." Significantly, IARC also found that the "Berman & Crump meta-analyses provided weak evidence that fibre length is a determinant of the potency of asbestos." Others believe that the disparity in results and methods renders quantitative risk assessments like these unreliable.[145] The lack of reliable exposure data

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[144] IARC. Monograph 100C: Asbestos (Chrysotile, Arnosite, Crocidolite, Actinolite and Anthophyllite), Lyon: International Agency for Research on Cancer (2012) (discussing Berman et al., *Update of potency factors for asbestos-related lung cancer and mesothelioma.* Crit. Rev. Toxicol, 38: Suppl 11–47 (2008) and Hodgson et al. The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure. Ann. Occup, Hyg.. 44: 565–601 (2000).

[145] Elliott et al., *Lung cancer mortality in North Carolina and South Carolina chrysotile asbestos textile workers.* Occup. Environ. Med. :10.1136 (2012) (citing Greenland, Meta-analysis. In: Rothman KJ, Greenland S, Lash TL. Modern Epidemiology, 3rd ed. Philadelphia: Lippincott Williams & Wilkins. 652e82 (2008) for proposition that the strong heterogeneity between

for most of the historic cohorts of asbestos exposed workers was a fundamental reason why the EPA abandoned its attempt to develop a "bin-specific" model for quantifying the danger of various types and sizes of asbestos fibers.[146] The weight of the evidence supports the conclusion and it is my opinion that all forms of asbestos cause mesothelioma, that the fibers of all lengths can contribute to the risk of disease and that the existing data is insufficient to *quantify* any differences in the relative potency of the types of asbestos for causing disease.[147]

All Types of Asbestos Cause Lung Cancer and Asbestosis

103. The Agency for Toxic Substances and Disease Registries (ATSDR) "assess[ed] all relevant toxicological testing and information that has been peer reviewed" and concluded in its 2001 Toxicological Profile on Asbestos that "[a]vailable evidence indicates that all asbestos fiber types

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cohorts underscores the potential differences between them and suggests a single estimate of effect may not be possible."). Berman himself has admitted to agreeing with eight criticisms of his methodology and only addressed two of them in the 2008 publication. *See* Berman, Wayne, Letter to Vivian Turner, EPA Science Advisory Board (1400F) re Comments on the Proposed Approach for Estimation of Bin-Specific Cancer Potency Factors for Inhalation Exposure to Asbestos (July 3, 2008).

[146] Silverstein et al., *Developments in asbestos cancer risk assessment*. Am. J. Ind. Med. 52:850–858 (2009); Johnson S. 2008, Letter from Stephen L. Johnson, EPA Administrator to Or Agnes Kane, Chair of Science Advisory Board Asbestos Committee. 12/29/2009.

[147] *Id.*

are fibrogenic".[148] The American Thoracic Society (ATS) also concluded in its 2004 statement Diagnosis and Initial Management of Non-Malignant Disease Related to Asbestos that all fiber types can cause lung fibrosis (asbestosis).[149] Recently, Loomis et al. (2010) reported on four textile plants using chrysotile asbestos that have shown an increased risk of both asbestosis and lung cancer, and the incidence of both diseases increased with increasing dose of asbestos.[150] Loomis et. al. also measured excess incidence of mesotheliomas among the various plants, including when plants that did not use commercial amphibole were excluded from the analysis.

104. Both the previously discussed toxicological data as well as the extensive human epidemiology prove that all forms of asbestos cause both lung cancer and asbestosis. ATSDR has concluded "[t]here is little doubt that all types of asbestos can cause lung cancer". For example, statistically significant increases in lung cancer mortality have been reported in workers exposed primarily

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[148] U.S. Public Health Service, U.S. Department of Health & Human Services. Toxicological profile for asbestos. Atlanta: Agency for Toxic Substances and Disease Registry; 2001.

[149] American Thoracic Society. Diagnosis and initial management of nonmalignant diseases related to asbestos. Am. J. Respir. Crit. Care Med.; 170(6):691–715 (Sep 15 2004).

[150] Loomis D., Dement J., Richardson D, Wolf S. *Asbestos fibre dimensions and lung cancer mortality among workers exposed to chrysotile.* Occup. Environ. Med. 2010 Sep; 67(9):580-4.

to chrysotile".[151] The International Agency for Research on Cancer (IARC) has also concluded that chrysotile asbestos causes lung cancer in humans.[152] A recent meta-analysis by Li reaches the same conclusion.[153] Analysis of a chrysotile cohort in China also confirmed "that exposure to chrysotile asbestos is associated with an increased risk of death from lung cancer and asbestosis, and shows a clear exposure response relationship."[154] Asbestos may be more potent for causing lung cancer than some previously thought.[155] The evidence shows that even low level exposures to asbestos causes a substantial

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[151] U.S. Public Health Service, U.S. Department of Health & Human Services. Toxicological profile for asbestos. Atlanta: Agency for Toxic Substances and Disease Registry; 2001.

[152] IARC. Asbestos: Monograph on the Evaluation of Carcinogenic Risk to Man. Lyon: International Agency for Research on Cancer; (1988).

[153] Li L. Sun TD, Zhang X, Lai RN, Li XY, Fan XJ et al. *Cohort studies on cancer mortality among workers exposed only to chrysotile asbestos: a meta-analysis.* Biomed. Environ. Sci. 2004 Dec; 17(4):459–68.

[154] Deng et al., *Exposure-response relationship between chrysotile exposure and mortality from lung cancer and asbestosis,* Occup. Environ. Med. (2011).

[155] Gustavsson, *Low-Dose Exposure to Asbestos and Lung Cancer: Dose-Response Relations and Interaction with Smoking in a Population-based Case-Referent study in Stockholm, Sweden,* Am J. Epidemiol. 155 (11) (2002).

number of lung cancers in occupationally exposed workers.[156]

105. Pleural plaques are often considered to be markers for significant asbestos exposure. Recently, researchers in France found a statistically significant association between pleural plaques and mesothelioma.[157] The unadjusted hazard ratio (HR) = 8.9, 95% confidence interval [CI] = 3.0 to 26.5 led Pairon et al. to conclude that '[t]he presence of pleural plaques may be an independent risk factor for pleural mesothelioma.' The greater the exposure to asbestos from brakes, the greater the likelihood of pleural plaques.[158] This makes sense because it is universally acknowledged that pleural plaques require greater exposures to asbestos than mesothelioma. Mechanics clearly have medically significant asbestos exposure in excess of that needed to cause mesothelioma.

Other Medical and Scientific Evidence that All Types of Asbestos Cause Mesothelioma

106. In addition to the extensive reliable epidemiological evidence that all types of asbestos cause mesothelioma in humans, there is substantial other evidence from animal studies

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[156] De Matteis et al., *Impact of Occupational carcinogens on lung cancer risk in a general population.* Int. J. Epidemiol. Advance Access (published March 31, 2012).

[157] Pairon el al., *Pleural Plaques and the Risk of* Pleural *Mesothelioma.* JNCI (Advance Access January 25, 2013).

[158] Amielle et al., *Asbestos-Related Diseases in Auto Mechanics.* Ann. Occup. Hyg. 56(1) 55 – 60 (2012).

that supports my opinion that all types of asbestos cause mesothelioma in humans. Lung cancer and mesothelioma have been found in rats in inhalation studies. Although the results vary, at least one study, Wagner et al. (1974) found chrysotile caused as many cancers as crocidolite.[159] Proper scientific inquiry requires consideration of all forms of animal studies regarding asbestos exposure, including, inhalation, instillation and injection studies. While each of these types of studies has limitations, they also have strengths and must be considered. This is no different than the strengths and limitations of various types of epidemiological studies or, for that matter, all types of scientific evidence.

107. Numerous animal studies have demonstrated all forms of asbestos cause mesothelioma using both intrapleural and intraperitoneal injection."[160]

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[159] IARC. Monograph 1000: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite and Anthophyllite), Lyon: International Agency for Research on Cancer (2012) (discussing Wagner et al., *The effects of the inhalation of asbestos in rats*. Br. J. Cancer, 29: 252–269 (1974)).

[160] Wagner, *Experimental production of mesothelium tumours of the pleura by implantation of dusts in laboratory animals*. Nature, 196: 180–181 (1962); Wagner et al., *Mesotheliomas in rats following inoculation with asbestos*. Br. J. Cancer, 23: 567–581 (1969); Pott et al., *Relevance of non-physiologic exposure routes for carcinogenicity studies of solid particles. In: Toxic and Carcinogenic Effects of Solid Particles in the Respiratory Tract*. 4th International Inhalation Symposium Hanover 1 – 5 March, 1993. Mohr U, editor. Washington, D.C: ILSI-Press, pp. 109–125 (1993); Stanton et al., *Relation of particle dimension to*

Studies exposing animals via intratracheal administration have shown that asbestos fibers induced lung tumors in rats, and lung tumors and mesotheliomas in hamsters.[161]

108. At least one animal study, Kogan et al. (1987), demonstrated peritoneal mesothelioma in rats exposed to high doses of chrysotile asbestos via intragastric administration.[162] Tumors were seen in 18 of 75 exposed rats, between 18–30 months after the beginning of the experiment, including two peritoneal mesotheliomas, eight gastric adenomas, two gastric adenocarcinomas, one gastric carcinoma, one cancer of the forestomach, one small intestine adenocarcinorna, and three abdominal lymphoreticular sarcomas. No tumors were observed in 75 control animals.

109. Studies of asbestos-exposed pets have also confirmed a relationship between environmental

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carcinogenicity in amphibole asbestoses and other fibrous minerals. J. Natl. Cancer Inst. 67: 965–975 (1981).

[161] Pott et al., *Carcinogenicity studies on fibres, metal compounds, and some other dusts in rats*. Exp. Pathol: 32:129–152 (1987); Smith et al., *Long-term health effects in hamsters and rats exposed chronically to man-made vitreous fibres*. Ann. Occup, 31: 413731–754 (1987); Pott et al., *Lung carcinomas and mesotheliomas following intratracheal instillation of glass fibres and asbestos*. In: Proceedings of the VIth International Pneumoconiosis Conference 20–23 September 1983, Bochum, Germany: International Labour Office, pp. 746–756 (1984).

[162] Kogan et al., *Possibility of inducing glandular cancer of the stomach in rats exposed to asbestos*. Br. J. Ind. Med. 44: 682–686 (1937). Given the shorter lifespan of rats as compared to humans, high doses of potential carcinogens are often used to evaluate the carcinogenic potential of a substance.

exposure to asbestos and mesothelioma. A case control study showed an 8 fold (statistically significant) increased risk of mesothelioma in dogs with asbestos exposures as compared to those without asbestos exposure."[163]

110 In an article by Gemba et al.,[164] a significant number of mesotheliomas, both pleural and peritoneal, were found in the automobile manufacturing industry. As the article points out, friction materials and other automobile products contain predominantly chrysotile. This further supports the conclusion that chrysotile exposure gives rise to multiple types of mesothelioma.

111. This conclusion is supported by experimental data that shows that chrysotile is transported to the pleural and peritoneum, and animal experiments showing development of lung fibrosis and lung cancer. Suzuki demonstrated that chrysotile preferentially transported to mesothelial tissues, like the pleura, while amosite is more likely to be retained in the lung itself.[165] Fiber studies also show that asbestos, including chrysotile, is also transported to the peritoneum. Fibrosis has been produced in animals by inhalation or by intratracheal

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[163] Glickman et al., *Mesothelioma in pet dogs associated with exposure of their owners to asbestos.* Environ. Res. 32: 305–313 (1983).

[164] Gemba et al., *National survey of malignant mesothelioma and asbestos exposure in Japan.* Cancer Sci. 103 (3):483 – 90 (2012).

[165] Suzuki. *Asbestos tissue burden study on human malignant mesothelioma.* Ind. Health. 39(2):150–60 (Apr 2001).

exposure to chrysotile.[166] In addition, studies in animals have reported increased incidence of lung cancer following chronic inhalation exposure to chrysotile.[167] Exposure to chrysotile fibers less than 5 microns in length (short fibers) is reported to increase the incidence of lung cancer, with a dose-response relationship.[168] The animal data strongly suggest that chrysotile asbestos fibers themselves, rather than amphibole contamination alone, plays a role in causing mesothelioma.[169] The data do not support a claim that fibers less than 5 microns are inert or non-potent nor was the adoption of the 5 micron length cut-off for NIOSH/OSHA measurements based upon any conclusion that fibers less than 5 microns in length are harmless.[170] Indeed,

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[166] O'Neill et al., *Lung Volume Changes in Rats Exposed to Chrysotile Asbestos*. Am. Rev. Respiratory Disease 123 (4) 146 (1981) ("Interstitial fibrosis was seen histologically in all exposed animals after one year and increased in severity during the year in air"). Purportedly tremolite-free Union Carbide brand asbestos produced similar results with less than half the dose.

[167] IARC. Asbestos: Monograph on the Evaluation of Carcinogenic Risk to Man. Lyon: International Agency for Research on Cancer; (1988); World Health Organization, Environmental Health Criteria 203: Chrysotile Asbestos. Geneva: World Health Organization; (1998).

[168] Stayner et al., *An epidemiological study of the role of chrysotile asbestos fibre dimensions in determining respiratory disease risk in exposed workers*. Occup. Environ, Med. 65(9):613–9 (Sep 2008).

[169] Frank et al., *Carcinogenic Implications of the Lack of Tremolite in UICC Reference Chrysotile*. Am. J. Ind. Med. 34:314–317 (1998).

[170] Lemen, *Asbestos in brakes: exposure and risk of disease*. Am. J. Ind. Med. 2004; 45(3):229–237 (2004); Dodson et al., *Asbestos*

NIOSH made clear the 5 micron counting protocol was a method of convenience because it used a readily available microscope and that it was "only an index of total fiber exposure and does not imply that shorter fibers do not pose a health hazard".[171]

112. Other relevant data on the ability of asbestos to cause human cancer include toxicokinetics (routes of exposure), deposition, clearance, and translocation in humans, molecular pathogenesis, and mechanisms of carcinogenesis.

113. Studies of extrapulmonary human tissues demonstrate that inhaled or ingested asbestos can reach most parts of the human body. For example, Auerbach et al. (1980) found asbestos in human kidney, heart, liver, spleen, adrenal, pancreas, brain, prostate and thyroid tissues.[172] Walls, et al. (2003) discussed a case of pericardial thickening and calcification where a pericardial biopsy "report showing the presence of 'numerous ferruginous (asbestos) bodies, some of which have the finely beaded appearance suggestive of

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Fiber Length as Related to Potential Pathogenicity: A Critical Review. Am. J. Ind. Med 44:291–297 (2003).

[171] NIOSH, Revised Recommended Asbestos Standard, DWIEW (NIOSH) Publication No. 77–169 (December 1976) (emphasis added).

[172] Auerbach et al., *Presence of Asbestos Bodies in Organs Other than the Lung*, Chest 77:2 pp, 133–137 (February, 1980).

asbestos.'"[173] I discuss additional findings of asbestos in extrapulmonary tissues below.

114. Several research organizations, including ATSDR[174] and IARC[175] have performed excellent reviews of the *in vivo* and *in vitro* evidence which supports a finding that all types of asbestos cause all the asbestos-related diseases, including mesothelioma (pleural, peritoneal, tunica vaginalis and pericardial). The *in vivo* and *in vitro* evidence overwhelmingly demonstrates that when asbestos comes in contact with mesothelial tissues, it causes the changes that can lead to mesothelioma.[176] Chrysotile asbestos, like all other types of asbestos, can and does cause various "mechanistic" events that are associated with mesothelioma, including the following: "impaired fibre clearance leading to macrophage activation, inflammation, generation of reactive oxygen and nitrogen species, tissue injury,

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[173] Walls et al., *An uncommon clinical presentation of asbestos-related disease*, New Zealand Med. J. Vol. 116 No 1171 (2003)

[174] U.S. Public Health Service, U.S. Department of Health & Human Services. Toxicological Profile for Asbestos. Atlanta Agency for Toxic Substances and Disease Registry; 2001 at Chapter 3 and 4. The profile was peer reviewed and "reflects the ATSDR's assessment of all relevant toxicologic information that has been peer reviewed."

[175] IARC. Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite And Anthophyllite), Lyon: International Agency for Research on Cancer (2012), sections 3 (Cancer in Experimental Animals) and 4 (Other Relevant Data).

[176] Straif K et al., *A review of human carcinogens*—part C: *metals, arsenic, dusts, and fibres.* Lancet Oncol.; 10(5):453-4 (May 2009).

genotoxicity, aneuploidy and polyploidy, epigenetic alteration, activation of signaling pathways, [and] resistance to apoptosis."[177]

115. Substantial evidence shows that asbestos fibers of all types can be inhaled deeply into the lung due to their aerodynamic qualities. Once in the lung, asbestos fibers of all types may also interact with lung epithelial cells, penetrate into the interstitium, and translocate to the pleura and peritoneum or more distant sites. Fibers that are not efficiently cleared or altered by physicochemical process (e.g, breakage, splitting, or chemical modification) are termed bio-persistent in the tissue where they are found. Many animal studies have looked at bio-persistence of asbestos is various tissues. As discussed above, while animal studies are important scientific evidence, it is important to be cautious when interpreting the data from such studies, due to methodological issues and differences between species.[178] As a recent review observed, "[t]he relevance of bio-persistence to [malignant mesothelioma] in humans has also been questioned. Due to the prolonged latency associated with mesothelioma, the absence of fibres at autopsy, some 40 years after first exposure, is hardly surprising".[179]

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[177] *Id.*

[178] IARC Man-made vitreous fibres, IARC Monograph Eval Carcinogens Risks Humans, 81: 1-381 (2002).

[179] Linton et al., *The ticking time-bomb of asbestos: Its insidious role in the development of malignant mesothelioma.* Critical

These authors also cautioned regarding potential biases that can be interjected into animal models by preparation of samples. For example, Bernstein et al. were faulted for aggressively treating the asbestos fiber in a manner that would "markedly shorten the bio-persistence of fibres."[180]

116. While many investigators have looked at asbestos content in the lungs, lung asbestos content is less relevant to questions of mesothelioma causation than it is to questions of asbestosis and lung cancer causation; mesothelioma occurs in the mesothelial tissues around the lungs (pleura), the abdomen (peritoneum), heart (pericardium) and sex organs (tunica vaginalis).[181] Numerous

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Reviews in Oncology/Hematology 84:2 200–212 (September 2012).

[180] *Id.*

[181] See, e.g., *Warnock et al., Asbestos and the Pathology of Lung Cancer*. Chest; 89120–26 (1986) ("the pulmonary asbestos burden is probably not an accurate indicator of the degree of asbestos exposure"); Sebastien et al., *Asbestos Retention in Human Respiratory Tissues: Comparative Measurements in Lung Parenchyma and in Parietal Pleura*, in Biological Effects of Mineral Fibre. Vol. 1 Wagner, J.C., ed. (1980) (a lung asbestos count "is not a good indicator of pleural retention"); Suzuki et al., *Asbestos fibers and human malignant mesothelioma*, in *Advances in the Prevention of Occupational Respiratory Diseases*, Chiyotani, Hosoda, Aizawa, eds. (1998) (arguing that "asbestos fibers in the lung do not fully represent a total picture of asbestos exposure because translocated asbestos fibers are not retained in the lung."); Suzuki et al., *Asbestos Tissue Burden Study on Human Malignant Mesothelioma*. Ind. Health 2001, 39, 150–60 (questioning the adequacy of approach of "researchers have been focusing almost exclusively on asbestos fibers in the lung tissue"); Dodson et al., 2008, *A Technical Comparison of Evaluating*

Asbestos Concentration by Phase-Contrast Microscopy (PCM), Scanning Electron Microscopy (SEM), and Analytical Transmission Electron Microscopy (ATEM) as Illustrated From Data Generated From a Case Report, Inhalation Toxicology, 20:723–732, (2008) (questioning the approach of looking at the lung when pleural or peritoneal cancer is at issue because "[w]ith respect to cancer, the concentration of asbestos at the site where the tumor starts is thought to be the most important factor in determining causation. It is impossible to know how much asbestos it takes to produce an asbestos-induced disease,"); Finkelstein, *Asbestos Fibre Concentrations in the Lungs of Brake Workers: Another Look*, Ann. Occup. Hyg. 52(6):455–461 (2008) (explaining that "since chrysotile is cleared from the lungs of brake workers, tremolite is arguably a better marker of exposure to Quebec chrysotile than is chrysotile itself"); Kohyama et al., *Analysis of Asbestos Fibers in Lung Parenchyma, Pleural Plaques, and Mesothelioma Tissues of North American Insulation Workers.* 643 Ann, N.Y. Acad. Sci. 27 (1991) (stating that "[d]espite the absence of high concentrations of chrysotile fibers in the lung, significant accumulation of chrysotile fibers in pleural and peritoneal tissues should be considered a potentially important factor in the induction of human malignant mesothelioma"); Baker. *Limitations in Drawing Etiologic Inferences Based on Measurement of Asbestos Fibers from Lung Tissue*, 643 Ann. N.Y. Acad. Sci. 61 (1991) (discussing the many problems with fiber burden analysis and criticizing fiber burden analysis as inadequate to estimate past exposures); McDonald et al., *The epidemiology of mesothelioma in historical context*. Eur. Respir. J. 9, 1932–1942. 1938 (1996) (discussing the potential problems and "substantial questions" of fiber burden analyses); Dufresne et al., *Fibers in Lung Tissues of Mesothelioma Cases Among Miners and Millers of the Township of Asbestos, Quebec*, Am. J Ind. Med. 27:581–592, 587 (1995) (explaining that "[b]ecause of the relatively low durability of chrysotile asbestos in lung tissues, it is difficult if not impossible to relate chrysotile lung content to asbestos-related diseases in humans"); Frank et al., *Carcinogenic Implications of the Lack of Tremolite in UICC Reference Chrysotile*, Am. J. Ind. Med. 34:314–317 (1998); Adib et al., *Short, Fine and WHO Asbestos Fibers in the Lungs of Quebec*

investigators have looked at tissue beyond the lungs and found asbestos, predominantly chrysotile, in people with mesothelioma. Studies confirm that asbestos fibers are biopersistent and accumulate in lung tissue as well as lymph nodes.[182] Asbestos fibers have also been identified in the pleura following autopsy[183] and in the parietal pleural in samples collected during thoracoscopy.[184] Tissue asbestos measurements consistently show that chrysotile asbestos is related to human mesothelioma; there have been numerous reports of mesotheliomas in people where chrysotile is the only or vast majority of the fiber present.[185] Fundamentally, it is well

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Workers With an Asbestos-Related Disease, Am. J. Industr. Med. (Online Accepted 4 February 2013).

[182] Dodson at al., ***Asbestos content of lung tissue, lymph nodes, and pleural plaques from former shipyard workers.*** Am. Rev. Respir. Dis. 142: 843–847 (1990); Dodson et at., ***Measurements of asbestos burden in tissues.*** Ann. N.Y. Acad. Sci. 1076: 281–291 (2006).

[183] E.g., Dodson et al., ***Asbestos content of lung tissue, lymph nodes, and pleural plaques from former shipyard workers.*** Am. Rev. Respir. Dis. 142: 843–847 (1990); Gibbs et al., ***Fibre distribution in the lungs and pleura of subjects with asbestos related diffuse pleural fibrosis.*** Br. J. Ind. Med., 48: 762–770 (1991); Suzuki et al., ***Asbestos tissue burden study on human malignant mesothelioma.*** Ind. Health, 39: 150–160 (2001).

[184] Boutin et al., ***Black spots concentrate oncogenic asbestos fibres in the parietal pleura. Thoracoscopic and mineralogic study.*** Am. J. Respir. Crit. Care Med. 153: 444–449 (1996).

[185] Godwin, ***Letter to the Editor: Asbestos and Mesothelioma.*** 204 JAMA 151 (1968) (finding that "[a]nalysis of tissue by x-ray diffraction indicated that chrysotile was the only form of asbestos present."); Rogers et al., ***Relationship Between Lung Asbestos***

Fiber Type and Concentration and Relative Risk of Mesothelioma: A Case-Control Study. 67 Cancer 1912 (1991) (reporting two cases of peritoneal mesothelioma with only chrysotile in their lungs, and two cases of mesothelioma with only chrysotile in their lungs with a history of exposure only to chrysotile.); Roggli et al., *Asbestos Fiber Type in Malignant Mesothelioma: An Analytical Scanning Electron Microscopic Study of 94 Cases.* Am. J. Ind. Med. 23:605–614 (1993) (concluding that "chrysotile along with its contaminant, tremolite — are capable of producing mesotheliomas in humans and experimental animals."); Dufresne et al., *Fibers in Lung Tissues of Mesothelioma Cases Among Miners and Millers of the Township of Asbestos, Quebec.* Am. J. Ind. Med. 27:581–592 (1995) (concluding that chrysotile (and its contaminant tremolite) were likely the cause of several cases of mesothelioma among this population."); Dodson et at., *Asbestos in Extrapulmonary Sites: Omentum and Mesentery.* Chest. 117; 486–493 (2000) (reporting that "[long fibers of chrysotile reached the momentum in several cases, which indicates that chrysotile is also translocated and could be potentially important in the pathogenesis of peritoneal mesothelioma."); Kohyama et al., *Analysis of Asbestos Fibers in Lung Parenchyma, Pleural Plaques, and Mesothelioma Tissues of North American Insulation Workers.* 643 Ann. N.Y. Acad. Sci. 27 (1991) (finding "fibrotic pleura and/or hyaline plaques of these workers were found to contain mainly chrysotile, the converse was true for the lung parenchyma. . . . [L]arge numbers of chrysotile fibers were detected in the extrapulmonary sites, such as in the pleural plaques and in pleural and peritoneal mesotheliomatous tissues."); Suzuki at al., *Translocation of Inhaled Asbestos Fibers From the Lung to Other Tissues.* Am. J. Ind. Med. 19:701–704, 702 (1991) (reporting "asbestos fibers detected in [a type of peritoneal fibrosis] were overwhelmingly chrysotile"); Suzuki et al., *Asbestos fiber and human malignant mesothelioma, in Advances in the Prevention-of Occupational Respiratory Diseases*, K. Chiyotani et al., eds. (1998) (indicating that "[t]he asbestos type seen in the mesothelial tissue was chrysotile alone in the majority (68/86; 79,0%)."); Suzuki et al., *Asbestos Tissue Burden Study on Human Malignant Mesothelioma.* Ind, Health 39, 150–160 (2001) (on review of lung and mesothelial tissue, the authors reported [c]hrysotile was the

recognized and generally accepted that lung tissue fiber burden does not provide an accurate index of prior exposures to chrysotile asbestos.

117. Because mesothelioma occurs outside the lung, in peritoneum, pleura, and mesothelial tissue around the heart and testes, the tissue burden analysis of greatest interest is that of outside the lung. Auerbach, et al., (1980) investigated the translocation of asbestos throughout the body and found asbestos bodies in nine different organs including the heart.[186] Huang, et al. (1988) found asbestos in many different extrapulmonary sites.[187] In a series of papers,

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most common asbestos type detected in the mesothelial tissues. It was present in 62 of the 64 cases (96.9%); chrysotile was exclusively detected in 48 of the 62 cases (77.4%)."); Suzuki et al., *Asbestos Fibers Contributing to the Induction of Human Malignant Mesothelioma.* Ann, N.Y. Acad. Sci. 982:160–176 (2002) (finding six cases of mesothelioma (including one case of peritoneal mesothelioma) with solely chrysotile present in the lung tissue.).

[186] Auerbach et al. *Presence of Asbestos Bodies in Organs other then the Lung*, Chest 77: 2 (February 1980). The authors found asbestos bodies in the kidney, heart, liver, spleen, adrenals, pancreas, brain, prostate, and thyroid.

[187] Huang et al, *Asbestos Fibers in Human Pulmonary and Extrapulmonary Tissues*, Am. J. Indust. Med, 14: 331–339 (1988).

Suzuki et al. (2001;[188] 2002[189]; and 2005[190]) compared asbestos content of the lung tissue of mesothelioma victims and extra-pulmonary tissues. Asbestos is even found in stillborn infants where the likely route exposure was through the bloodstream of the mother.[191] Dodson et al. (2006) also discussed this evidence and additional findings.[192] Suzuki et al. (2002) found that

> In mesothelial tissues, chrysotile fibers were 30.3 times more common than amphiboles. . . . In some mesothelioma cases, the only asbestos fibers detected in either lung or mesothelial tissue were chrysotile fibers. . . . The average number of asbestos fibers in both lung and mesothelial tissues was two orders of magnitude greater than the number found in the general population. . . . The majority of

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[188] Suzuki et al.. *Asbestos tissue burden study on human malignant mesothelioma.* Ind. Health. 39: 150–160 (2001).

[189] Suzuki et al., *Asbestos Fibers Contributing to the Induction of Human Malignant Mesothelioma.* Ann. N.Y. Acad., Sci. 982: 160–176 (2002).

[190] Suzuki et al., *Short, thin asbestos fibers contribute to the development of human malignant mesothelioma: pathological evidence.* Int. J. Hyg. Environ-Health 208: 201–210 (2005).

[191] Hague, et. al, *Assessment of Asbestos Burden in the Placenta and Tissue Digests of Stillborn Infants in South Texas,* Arch, Environ. Contam. Toxicol, 35, 532–538 (1998).

[192] Dodson et al., *Measurements of asbestos burden in tissues.* Ann. N. Y., Acad. Sci., 1076: 281–291 (2006).

> asbestos fibers in lung and mesothelial tissues were shorter than 5 um in length.[193]

Chrysotile asbestos "was exclusively detected in 55 of the 74 cases (74.3%)" of Suzuki's cases.[194] Based on those findings, Suzuki concluded:

> 1) Fiber analysis of both lung and mesothelial tissues must be done to determine the types of asbestos fibers associated with the induction of human malignant mesothelioma; 2) short, thin asbestos fibers should be included in the list of fiber types contributing to the induction of human malignant mesothelioma; 3) Results support the induction of human malignant mesothelioma by chrysotile.[195]

118. According to Suzuki et al. (2005), their data demonstrates that among asbestos types detected in the lung and mesothelial tissues, "chrysotile was the most common asbestos type to be categorized as short, thin asbestos fibers. . . . Compared with digestion technique of the bulk tissue, ashing technique of the tissue section was more effective to detect short, thin fibers. We conclude that contrary to the Stanton hypothesis, short, thin, asbestos fibers appear to contribute to the causation of human malignant

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[193] Suzuki et al., *Asbestos Fibers Contributing to the Induction of Human Malignant Mesothelioma.* Ann, N.Y. Acad, Sci. 982: 160–176 (2002).

[194] Suzuki et al., *Asbestos Fibers Contributing to the Induction of Human Malignant Mesothelioma*, Ann. N.Y. Acad. Sci. 982:160–176 (2002)

[195] *Id.*

mesothelioma." In Suzuki's lab, "such fibers were the predominant fiber type detected in lung and mesothelial tissues from human mesothelioma patients."[196] Gordon et al., examined the lymph node and lung tissues of 100 cases and found chrysotile-only in several cases and concluded that "mesotheliomas cannot be considered idiopathic or unrelated to chrysotile exposure when it is possible to identify the causative agent in the lungs and/or regional lymph nodes, regardless of the amount."[197] These findings suggest that it is not prudent to take the position that short asbestos fibers convey little risk of disease."[198] Sebastien et al. (1980);[199] Dodson et al. (2000a; 2000b; and 2003)[200] and Adib et al.

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[196] Suzuki et al., *Short, thin asbestos fibers contribute to the development of human malignant mesothelioma: pathological evidence.* Int. J. Hyg. Environ.-Health. 208: 201–210 (2005).

[197] Gordon et al., *Abstract, Asbestos Fiber Burden Analysis of Lung and Lymph Nodes in 100 Cases of Mesothelioma.* Am. J. Respir. Crit. Care Med. 179; A5892 (2009).

[198] Suzuki et al., *Short, thin asbestos fibers contribute to the development of human malignant mesothelioma: pathological evidence.* Int. J. Hyg. Environ.-Health. 208: 201–210 (2005).

[199] Sebastien et al.. Asbestos retention in human respiratory tissues: Comparative measurements in long parenchyma and in parietal pleura. In: Wagner. J.C., editor. Biological effects of mineral fibers. Lyon: IARC. p 237–246 (1980).

[200] Dodson et al., *Asbestos content in the lymph nodes of nonoccupationally exposed individuals.* Am. J. Ind. Med. 37: 169–174 (2000a); Dodson et al., *Asbestos in extrapulmonary sites. – Omentum and mesentery.* Chest. 117:486 493 (2000b): Dodson et al., *Asbestos fiber length as related to potential pathogenicity: A critical review.* Am J. Indus. Med. 44:291–297 (2003).

(2013)[201] further support a cautious approach to ignoring the effects of short, thin chrysotile fibers,

119. The above-referenced evidence led on group of reviewers to comment that "[a]sbestos fibers are found in all organs of subjects either occupationally exposed or not exposed to asbestos."[202]

120. Accordingly, it is generally recognized that a reliable occupational history — and not lung fiber burden studies — is the best indicator of past exposures to chrysotile[203] and that the absence of chrysotile on digestion, particularly at low magnification, does not provide a basis for concluding that an individual did not have a biologically significant exposure to chrysotile in the past.[204] "The best indicator of past asbestos exposure (the gold standard) remains the detailed past work history."[205]

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[201] Adib et al., *Short, Fine and WHO Asbestos Fibers in the Lungs of Quebec Workers. With an Asbestos-Related Disease.* Am. J. Ind. Med. (Online Accepted 4 February 2013).

[202] Miserocchi et al, *Translocation pathways for inhaled asbestos fibers.* Environ. Health 7:4; 1–8 (2008).

[203] Roggli et al., *Tremolite and Mesothelioma.* Ann. Occup. Hyg. 5:447–53 (2002).

[204] Baker, *Limitations in Drawing Etiologic Inferences Based on Measurement of Asbestos Fibers from Lung Tissue.* 643 Ann. N.Y. Acad. Sci., 61 (1991).

[205] Begin et al, *Detailed Occupational History - The Cornerstone in Diagnosis of Asbestos-related Lung Disease*, Am. J. Resp. Critical Care Med. 163 (3 pt 1 598–99 (2001).

Human Case Reports Support the Conclusion that All Types of Asbestos Cause Human Mesothelioma

121. Epidemiology is not required to reach conclusions regarding causation. For example, one tongue-in-cheek publication pointed out that medical science does not require an epidemiological study to know that the use of parachutes reduces the risk of death for people jumping out of airplanes.[206] It is also important to recognize that occupational and environmental epidemiology is a blunt instrument and is not, in most cases, well suited to examining precise dose-response relationships.

122. Because the consensus of the mainstream medical and scientific community is that, in North America and elsewhere, mesothelioma is a "signal tumor" or "signature tumor" with essentially one cause — asbestos — the scientific community has long considered individual cases of mesothelioma to be sentinel events. A sentinel event is a case of disease that, when it appears, signals the need for action. In 1983 Rutstein developed a list of Sentinel Health Events ("SHE-O") that are occupationally related.[207] Mesothelioma was included as a sentinel disease

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[206] Smith et al., *Parachute use to prevent death and major trauma related to gravitational challenge systematic review of randomised controlled trials*. Brit. Med. J. Vol. 327 (Dec. 23 – 27, 2003).

[207] Rutstein et al., *Sentinel health events (occupational): a basis for physician recognitions and public health surveillance*. Am. J. Pub. Health. 73:1054–61 (1983).

for asbestos exposure on the initial list of SHE-O, and has been included in all subsequent revisions. In fact, most asbestos scientists agree that the worldwide acceptance of mesothelioma as an asbestos-related cancer began with the case series published by Wagner in 1960.[208] When examining the question of causation of sentinel diseases like mesothelioma the scientific community recognizes that case reports and case series reports are useful and valid tools.

123. Moreover, unlike many other cancers, for which there are multiple, well-documented causal factors, mesothelioma is overwhelmingly caused by asbestos. "Mesothelioma is a rare cancer with one major etiologic exposure, therefore surveillance using each case as a sentinel event might seem more reasonable for this disease than for cancers with multi-factorial causation."[209]

124. Case series — such as Wagner (1960) — are particularly informative in situations where there are identified occurrences of very rare conditions for which there are few, if any, established causal factors. In fact, recognition of even a small number of eases of the "sentinel" diseases — such as liver angiosarcoma related to

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[208] Wagner et al., *Diffuse pleural mesothelioma and asbestos exposure in the North Western Cape Province*. Br. J. Ind. Med. [17], 260–271. (1960).

[209] Teschke et al., *Mesothelioma surveillance to locate sources of exposure to asbestos*. Can. J. Public Health: 88(3):163–8 (May 1997).

vinyl chloride and malignant mesothelioma which is strongly related to asbestos exposure.[210]

125. The scientific community has concluded that, for sentinel diseases such as mesothelioma, case series reports can be sufficient by themselves to allow reliable conclusions to be drawn regarding causation. Again, as noted by Checkoway:

> "Case series reports can be virtually conclusive in their own right when the health outcome is a very rare disease or an uncommon manifestation of a relatively common condition."[211]

126. Not surprisingly, the medical literature contains numerous case reports of mesotheliomas caused by as little as a few months, weeks, or even days of asbestos exposure.[212] Over the past several

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[210] Checkoway et al., Research Methods in Occupational Epidemiology, 2nd ed. London: Oxford University Press; (2004).

[211] *Id.*

[212] See, e.g., Skarnmeritz et al., *Asbestos Exposure and Survival in Malignant Mesothelioma: A Description of 122 Consecutive Cases at an Occupational Clinic.* 2(4) J. Occup. & Environ. Med. 228, 228–29 (Oct. 2011); K. Browne & W.J. Smither, *Asbestos-related Mesothelioma: Factors Discriminating between Pleural and Peritoneal Sites.* 40 Br. J. Ind. Med. 145, 147 (1983) (in a study of 143 cases of mesothelioma, 32 cases were exposed for under one year, of whom 21 had no more than six months of exposure and 9 had no more than three months); Morris Greenberg & T.A. Lloyd Davies, *Mesothelioma Register 1967–68,* 31 Br. J. Ind. Med. 91, 96, 103 (1974) (documenting mesothelioma following an asbestos exposure of 3 weeks in one case and 1 day in another); 1965 Newhouse and Thompson Paper at 267 (documenting 2 cases of mesothelioma with 2 months or less exposure to asbestos); Maxwell Brow et al., *Critical Review, Mesothelioma following Exposure to Asbestos: A review of 72*

decades many case series of mesothelioma have been published, and some of these reports provide detailed exposure histories for the mesothelioma cases. Many of these cases of mesothelioma have had limited exposure to asbestos, either because the exposure was of a short duration or because it occurred in a scenario unlikely to generate high levels of airborne fibers. For example, Browne and Smithers,[213] in a study of 143 cases of mesothelioma, reported that 32 cases were exposed for less than one year, of whom 21 had no more than six months and 9 had no more than three months asbestos exposure. Greenberg and

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Cases. 64(5) Chest 641, 642 (1973) (documenting mesotheliomas in stock clerks who worked in areas "not heavily contaminated with asbestos" for 10 months and 18 months respectively). See also National Institute for Occupational Safety & Health, U.S. Department of Health & Human Services. Workplace Exposure to Asbestos, Review and Recommendations, Publication No. 81-103, 3 (1980) ("[A]ll levels of asbestos exposure studied to date have demonstrated asbestos-related disease, and a linear relationship appears to best describe the shape of the dose-response curve. These considerations led the committee to conclude that there is no level of exposure below which clinical effects do not occur. Third, the absence of a threshold is further indicated by the dramatic evidence of asbestos-related disease in members of asbestos-worker households and in persons living near asbestos-contaminated areas. These household and community contacts involved low level and/or intermittent casual exposure to asbestos. Studies of duration of exposure suggest that even at very short exposure periods (1 day to 3 months) significant disease can occur.").

213 Browne et al. *Asbestos-related mesothelioma factors discriminating between pleural and peritoneal sites.* Br. J. Ind. Med., 40: 145–52 (1983).

Davies,[214] reporting on cases of documented mesothelioma from a mesothelioma register between 1967–68, found several with short duration of exposure: one case had only 1 day of exposure to sawing asbestos cement sheets (an activity known to cause exceptionally high concentrations of airborne asbestos dust); another case had limited household exposure through her husband who worked in an asbestos factory for only two years, and a third had intermittent exposure to asbestos through her brother's work over a 3 year period. Newhouse and Thompson[215] reported 2 cases of mesothelioma with 2 months or less exposure to asbestos in a case series from London. In 1973, Borow[216] reviewed 72 cases, which included 2 mesotheliomas in stock clerks who worked in areas not heavily contaminated with asbestos" for 10 months and 18 months respectively. In 2001, Neumann described the characteristics of 1,600 mesothelioma cases from the German mesothelioma registry from 1987–1999, and reported exposure as short as 1 month in one case. (The authors also reported that over 95% of all the cases had an elevated asbestos fiber burden.) Leigh et al, have described the

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[214] Greenberg et al., *Mesothelioma register 1967-68.* Br. J. Ind. Med. 31(2):91–104 (Apr 1974).

[215] Newhouse et al., Mesothelioma of pleura and peritoneum following exposure to asbestos in the London area. Br. J. Ind. Med. 1993; 50(9)769–78 (Sep 1965).

[216] Borow et al., Mesothelioma following exposure to asbestos: a review of 72 cases. Chest. 64(5):641-6 (Nov 1973)

characteristics of mesothelioma cases from 1945–2002 from the Australian Mesothelioma Surveillance Program, and report that 3% of cases had exposures shorter than 3 months; the shortest duration of exposure for one case of mesothelioma was 16 hours of loading asbestos fiber on ships. (an activity known to cause exceptionally high concentrations of airborne asbestos dust).[217] Miller[218] reviewed the details of 32 mesothelioma cases attributed to household exposure; one case lived in the same boarding house as several shipyard workers for 8 years, another was a wife exposed to asbestos on her husband's clothes for only a year, and 3 others had household exposure less than 3 years. Hansen[219] described the pattern of asbestos-related disease in residents of Wittenoom Township in Australia, the location of a large asbestos mine. Twenty-four residents who had never worked in the mine developed mesothelioma by the time of this report; two had lived in Wittenoom for a very short time (6 weeks and 3 months) and had no other identified

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[217] Leigh et al., *Malignant mesothelioma in Australia, 1945-2002.* Int. J. Occup. Environ. Health. 9(3):206–17 (Jul 2003)

[218] *Miller, Mesothelioma in Household Members of Asbestos-Exposed Workers: 32 United Slates cases since 1990.* Am. J. Ind. Med.; 47:458–62 (2005).

[219] Hansen et al., *Environmental exposure to crocidolite and mesothelioma: exposure-response relationships.* Am. J. Respir. Crit. Care Med.; 157(1):69–75 (Jan 1998).

exposure to asbestos. Ascoli[220] described a series of 79 cases, among whom two cases had exposure to asbestos solely through living or working in a building with asbestos insulation or roofing. Schneider[221] reported a case of mesothelioma with asbestos exposure documented through a fiber burden analysis of the lung; her only exposure to asbestos was working for three years in an office where asbestos has been sprayed onto steel beams exposed in the ceiling, and had no other exposure to asbestos. Chen[222] reported a similar case of mesothelioma in a man whose only exposure to asbestos was on visits to building sites in his role as executive of a building materials firm; asbestos exposure was documented through lung fiber analysis. Lemen (2004) reported, based on a review of the published literature relating to brakes, more than two hundred (200+) cases of mesothelioma in people exposed to chrysotile asbestos from brakes.[223] Consistent with these findings, Welch, et. al. published a small case-control study of college-educated men with peritoneal

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[220] Ascoli et al., *Malignant mesothelioma in Rome, Italy* 1980–1995, *A retrospective study of 79 patients.* Tumori; 82(6):526–32 (Nov 1996).

[221] Schneider et al. *Pleural Mesothelioma Associated with Indoor Pollution of Asbestos.* J. Cancer Res. Clin. Oncol. 127(2):123–7 (2001).

[222] Chen et al. *Malignant mesothelioma with minimal asbestos exposure.* Hum. Pathol.; 9(3):253–8 (May 1978).

[223] Lenten, *Asbestos in brakes: exposure and risk of disease.* Am. J. Ind. Med. 45(3);229–237 (2004).

mesothelioma and limited past exposures to asbestos, a finding contrary to the claim that asbestos-related peritoneal mesotheliomas only occur after high dose exposures to asbestos. These cases demonstrate that very limited exposure to asbestos is found in many case series of mesothelioma. Case reports and case series show that mesothelioma occurs in people with exclusively chrysotile exposure or with mostly chrysotile exposure.[224] A recent registry study

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[224] Enticknap et al., *Peritoneal Tumours in Asbestosis*, Br. J. Ind. Med. 21, 20 (1964); Godwin et al., *Letter to the Editor: Asbestos and Mesothelioma*. 204 JAMA 151 (1968); Champion, *Two Cases of Malignant Mesothelioma after Exposure to Asbestos*, 103 Am. Rev. Resp. Disease 821 (1971); Borow et al., *Mesothelioma following Exposure to Asbestos: A Review of 72 Cases*, Chest. 64;641–646 (1973)(finding all 72 cases of mesothelioma occurred since the mill had been using predominantly chrysotile and that "it has been shown clinically and experimentally that Chrysotile is a factor in the development of mesothelioma."); Acheson et al., *Mortality of two groups of women who manufactured gas masks from chrysolite and crocidolite asbestos: a 40-year follow-up*. Br. J., Ind. Med. 39;344–348 (1982) (reporting a case of mesothelioma among employees at a factory that used only chrysotile); Cullen et al., *Chrysolite Asbestos and Health in Zimbabwe: I. Analysis of Miners and Millers Compensated for Asbestos-Related Diseases Since Independence*. (1980), Am. J. Ind. Med. 19:161–169 (1991) (finding two cases of mesothelioma among Zimbabwe chrysotile miners; one confirmed autopsy and a second probably case); Egilman et al., *Abuse of Epidemiology: Automobile Manufacturers Manufacture a Defense to Asbestos Liability*. Int. J. Occup. Environ. Health 11:360–371 (2005) (reporting new cases of mesothelioma out of a plant using predominantly chrysotile); Egilman et al., *A Case of Occupational Peritoneal Mesothelioma From Exposure to Tremolite-Free Chrysotile in Quebec, Canada: A Black Swan Case*. Am. J. Ind. Med. (2010) (reporting a peritoneal mesothelioma from exposure to asbestos

identified large numbers of pleural and peritoneal mesotheliomas with low-level chrysotile exposure in the Japanese automobile manufacturing industry.[225]

There is No Safe Exposure to Any Type of Asbestos: Exposures Above Background Can Cause Mesothelioma in Humans

127. There is no safe level of exposure to any type of asbestos fiber. Asbestos is genotoxic.[226] Genotoxic agents are recognized as having no safe level or threshold of exposure for carcinogenic effects.[227] This is not a new or novel opinion in the medical and scientific community; rather the literature is replete with physicians and scientists reaching that opinion. In 1956, one asbestos company scientist published his opinion that it is prudent to set the standard for cancerigenic [sic] substances substantially at zero . . . and no considerations can justify allowing inhalation of any concentration which is avoidable."[228]

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in a chrysotile mine which may not be contaminated with tremolite).

[225] Gemba et al., *National survey of malignant mesothelioma and asbestos exposure in Japan.* Cancer Sci. 103 (3):483–90 (2012).

[226] Strait K et al., *A review of human carcinogens--part C: metals, arsenic, dusts, and fibres.* Lancet 10(5):453–4 (May 2009) (Table: Metals, arsenic, dusts and fillers assessed by the IARC Monograph Working Group).

[227] Patty's Industrial Hygiene (5th Ed.) Vol. 3 CH. 40 page 1872.

[228] Smyth, *Improved Communication — Hygienic Standards for Daily Inhalation.* Ind. Hyg. Quarterly. 17(2) (1956) (Dr. Smyth was an employee of Union Carbide, which at the time was a major

128. In 1964, at a major medical conference on asbestos-related disease, another asbestos industry medical officer expressed the opinion clearly and concisely:

> Our own conclusion, as we began seeing what was happening in our own process, was that *the only safe amount of asbestos dust exposure was zero* and that the efforts in terms of achieving that lay basically in engineering, and, secondly, in education. But as far as a safe level of asbestos dust is concerned, our own conclusion in Hogansville, Ga., is that there is no safe level. *The safe level is nil and anything above the safe level represents certain risk.*"[229]

This echoes the work of Merewether et al. of several decades earlier.[230]

129. Experienced medical and scientific experts continue to agree that there is no safe level of exposure to asbestos. For example, in 2011, the Inspector General for the United States Environmental Protection Agency wrote that

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manufacturer of asbestos containing phenolics and which later became a major miner and distributor of asbestos).

[229] Wells, Ann. N.Y. Acad. Sci. 132 (1)1-766 (1965) (reporting discussion at page 336) (emphasis added).

[230] Merewether et al., *Reports on Effects of Asbestos Dust on the Lungs and Dust Suppression In the Asbestos Industry*. Her Majesty's Stationery Office (1930).

"[a]sbestos is a human carcinogen with no safe level of exposure.[231]

130. Studies show excess of mesothelioma with non-occupational exposures, which are generally understood to be lower doses that occupational exposures. These data in combination with the data that 90% or more of mesotheliomas have either a documented or demonstrated history of exposure or substantial asbestos in lung tissue, again suggest that the potential of causation by asbestos should be considered for every mesothelioma.

131. A large case-control study by Iwatsubo et al., found an excess of pleural mesothelioma in the lowest exposure group with an estimated total exposure between 0.001 and 0.49 yrs.[232]

132. Rödelsperger concluded there was a distinct dose-response relationship, even at extremely low levels of asbestos exposure, with exposures from >0 to <0.15 f/cc-yrs showing a significantly increased risk of mesothelioma.[233]

133. In 2000, Bourdès et al. reviewed the literature and performed a meta-analysis of the risk-of

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[231] USEPA, Office of Inspector General, Early Warning Report: Use of Unapproved Asbestos Demolition Methods May Threaten Public Health, Report No. 12-P-0125 (December 14, 2011).

[232] Iwatsubo et al., *Plueral mesothelioma: Dose response relation at low levels of asbestos in a French population-based case-control study*. Am. J. of Epidemiol. 148:133–142 (1998).

[233] Rödelsperger et al., *Asbestos and man-made vietreous fibers as risk factors of diffuse malignant mesothelioma: Results from a German hospital-based case-control study*. Am. J. Ind. Med. 39:262–275 (2001).

pleural mesothelioma from environmental exposure to asbestos.[234] Bourdès et al., identified eight relevant studies on the risk of pleural mesothelioma from household or neighborhood exposures to asbestos. These studies did not include the case-control studies outlined below. These authors found that the relative risks of pleural mesothelioma for household exposure ranged between 4.0 and 23.7. They also found a summary risk estimate of 8.1 (9.5% C1, 5.3–12). For neighborhood exposures, the relative risks reported ranged between 5.1 and 9.3 and the summary estimate was 7.0 (95% CI, 4.7–11). This analysis appears to be in agreement with the studies by Magnani et al.[235] and Rödelsperger et al. (see above). Bourdès et al. commented that their data were insufficient to estimate the magnitude of excess risk at the levels of environmental exposure commonly experienced by the general population in industrial countries (in other words, from the general environment).

134. Pan et al. (2005) performed a population-based study on the distribution of mesothelioma in California.[236] After attempted allowance for

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[234] Bourdès et al., *Environmental exposure to asbestos and risk of pleural mesothelioma: review and meta-analysis.* Eur. J. 16:411-417 (2000).

[235] Magnani et al., *Multicentrie study on malignant pleural mesothelioma and non-occupational exposure to asbestos.* Br. J. Cancer. 83: 104–111 (2000).

[236] Pan et al., *Residential proximity to naturally occurring asbestos and mesothelioma in California,* Am. J. Respir. Crit. Care Med. 172:1019–1025 (2005).

occupational exposures, these researchers reported an apparent direct correlation between the risk of mesothelioma and proximity of residence according to the distribution of asbestos-containing rocks in the general environment (mainly chrysotile, with some other forms of asbestos including tremolite). These authors found about a 6% reduction in the odds of mesothelioma for residence for every 10 km further away from the asbestos-containing rocks.

135. In the article by Hodgson et al. (2000), there is extrapolation information with regards to crocidolite that at cumulative exposure levels of only 0.01 f/ml-yrs, there are 20 deaths per 100,000 exposed with the highest arguable estimate 100 and the lowest 2 cases. Even at the lowest estimate of 2 cases per 100,000 exposed, this would be in excess of 20 times the figure commonly used as an assumed level of background or spontaneous mesothelioma development, which is approximately 1–2 cases per million people per year.[237] With respect to amosite, at a level of cumulative exposure of 0.01

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[237] One should note that this is an assumed level used to allow a standard for comparison. While it is commonly used as a comparison point, as discussed above, several significant papers have failed to find evidence to support any measurable "background" incidence of mesothelioma. Strauchen, *Rarity of Malignant Mesothelioma Prior to the Widespread Commercial Introduction of Asbestos: The Mount Sinai Autopsy Experience* 1883 — 1910, Am, J. Industr. Med. 1–3 (2011); Mark et al., *Absence of Evidence for a Significant Background Incidence of Diffuse. Malignant Mesothelioma Apart from Asbestos Exposure.* Ann. N.Y. Acad. Sci. 643:196 – 204 (1991).

f/ml-yrs, the estimate is 3 deaths per 100,000 exposed, with the highest arguable estimate 20 and the lowest insignificant. For chrysotile, the risk for development of mesothelioma at 0.01 f/ml-yrs was stated to be probably insignificant, although the highest arguable estimate was 1 death per 100,000 exposed, which would still be 10 times that of the assumed background rate of 1 case per 1,000,000. The authors stated: "Taking this evidence together, we do not believe there is a good case for assuming any threshold for mesothelioma risk."[238]

136. The consensus is that medical science has yet to identify a threshold or minimum amount of asbestos exposure required to cause mesothelioma.[239]

137. An update by Hodgson and Darnton in 2009 concerning mesothelioma risk from chrysotile asbestos stated that, when information from a

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[238] Hodgson, J.T. and Darnton, A. *The quantitative risk of mesothelioma and lung cancer in relation to asbestos exposure.* Ann. Occup. Hyg.; 44:565–601; specifically, Table 11, page 585 (2000).

[239] Wiggins, Statement on malignant mesothelioma in the United Kingdom, 56 Thorax 250,252 (2001) ("[t]here is no evidence for a threshold dose of asbestos below which there is no risk" of mesothelioma); World Health Org'n, Environmental Health Criteria 203: Chrysolite Asbestos, 144 (1998) ("No threshold has been identified for-carcinogenic risks."). In fact, attempts to deduce such a threshold for mesothelioma have been dismissed as "logical nonsense." *See* John T. Hodgson & Andrew Darnton, *The Qualitative Risks of Mesothelioma and Lung Cancer in Relation to Asbestos Exposure.* 44 Ann. Occup. Hyg. 565, 583 (2000).

number of recent, well-conducted studies was incorporated into their mathematical model, the risk of mesothelioma caused by chrysotile derived from these data increased by a factor of 10 over the estimate from their earlier meta-analysis. The authors stated these new results strengthened the case for the proposition that the per fibre risk of mesothelioma from chrysotile textile plants was greater than it was in the mines. Whether this applied to other settings of chrysotile was stated to not be clear.[240] What is abundantly clear is that these estimates are susceptible to vast sways in magnitude depending upon the data included. Significantly, Hodgson & Darnton's recalculation likely still underestimates the potency of chrysotile because they failed to include numerous chrysotile-induced mesotheliomas from the Connecticut chrysotile cohorts.[241] Inclusion of these cases of chrysotile-induced mesotheliomas in Hodgson & Darnton's model would obviously diminish the magnitude of potency differences substantially.

138. In an abstract presented at the International Mesothelioma Interest Group Meeting, Rolland et al. evaluated the risk of pleural mesothelioma in a French population-based case-control study

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[240] Hodgson, J.T. and Darnton, A., *Mesothelioma risk from chrysotile.* Occup. Environ. Med. (2009).

[241] Finkelstein, M. et al, ***Mesothelioma among employees of a Connecticut factory that manufactured friction materials using chrysotile asbestos.*** Ann. Occup. Hyg. 54:692–696 (2010) (reporting on several mesothelioma cases originally published by Egilman).

between 1998 and 2002. The authors studied 19 French districts within the National Mesothelioma Surveillance Program covering 25% of the French population. The report was based on 467 confirmed cases (80% males, 41–93 years old) and 868 controls matched for sex, age and district. The authors found that among men, the highest risk was observed for the occupations of plumbers, pipefitters, sheet metal workers, and for the industries of ship repair, asbestos products, metal products and construction. The authors stated a significant dose-response relationship was found between cumulative occupational asbestos exposure and pleural mesothelioma, even for the lowest category (greater than 0-0.07 fibers/ml year; odds ratio 2.8, 95%; CI 1.7-4.7).[242]

139. Indeed, the expert *consensus* is that there is no safe level of exposure to asbestos and that all levels of exposure carry with them some risk of cancer. None of the major scientific bodies that have studied asbestos and mesothelioma have been able to identify a level of asbestos exposure below which mesothelioma will not occur. *See* World Health Organization: "No threshold has been identified for the carcinogenic risk of chrysotile";[243] National Cancer Institute Fact

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[242] Rolland, P. et al, *Risk of pleural mesothelioma: A French population-based case control study [1998–2002].* Cancer, 54: Suppl IS9, abstract 35 (2006).

[243] World Health Organization. Elimination of asbestos-related diseases. Geneva, Switzerland: World Health Organization; Report No.: WHO/SDE/OEH/6.03 (2006).

Sheet, *Asbestos Exposure and Cancer Risk* ("the overall evidence suggests there is no safe level of asbestos exposure")[244]; the British Thoracic Society concludes that "a history of occupational asbestos exposure can be obtained in about 90% of cases in the U.K." and there is "no evidence for a threshold dose of asbestos below which there is no risk."[245] A recent study examining the relationship between historical asbestos use and disease rates further supports the conclusion that a linear dose-response relationship exists between exposure to asbestos and disease even at low doses.[246] In fact, the Occupational Health and Safety Administration (OSHA) determined that even at the lowest level of asbestos exposure at which OSHA found it feasible to set a standard in the workplace, 0.1 f/cc, there is significant risk of mesothelioma.[247]

140 Several agencies have commented that there is no safe level of exposure to asbestos:

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[244] National Cancer Institute. Factsheet - Asbestos: Questions and Answers. Bethesda MD, National Institutes of Health. Ref Type: Pamphlet (2003).

[245] British Thoracic Society, Statement on malignant mesothelioma in the United Kingdom, Thorax, 56(4):250–65 (2001).

[246] Lin, RT. et al., *Ecological association between asbestos-related diseases and historical asbestos consumption: an international analysis.* Lancet. 369(9564):844-9 (Mar. 10, 2007).

[247] Occupational Safety and Health Administration. Occupational exposure to asbestos; final rule. Federal Register; 59:40964-1162(1994).

a. NIOSH, 1976 (page 92): "excessive cancer risks have been demonstrated at all fiber concentrations studied to date. Evaluation of all available human data provides no evidence for a threshold or a 'safe' level of asbestos exposure."

b. NIOSH, 1980 (page 3): "All levels of asbestos exposure studied to date have demonstrated asbestos related disease...there is no level of exposure below which clinical effects do not occur."

c. USPHS, 1980: "it is important to point out that when a permissible level for exposure (PEL) to a certain carcinogen is set by OSHA, there is no implication that such a level is safe. To the contrary, it is the agency's policy that any occupational exposure to a carcinogen carries with it some risk of disease, even if it cannot be easily or precisely measured."

d. NIOSH, 1986 (page 319): "a linear, no threshold, dose-response relationship . . . Any asbestos exposure carries with it some increased risk of asbestos related disease."

e. OSHA, 1994 (page 40978): "reducing exposure to 0.1 f/cc would further reduce, but not eliminate, significant risk. The 0.1 f/cc level leaves a remaining significant risk."

f. WHO, 1998 (page 144): "Exposure to chrysotile asbestos poses increased risks for asbestosis, lung cancer and mesothelioma in a dose-dependent manner. No threshold has been identified for carcinogenic risks."

g. WTO, 2000: "the experts confirm the position of the European Communities according to which it has not been possible to identify any threshold below which exposure to chrysotile would have no effect. The experts also agree that the linear relationship model, which does not identify any minimum exposure threshold, is appropriate for assessing the existence of a risk. We find therefore that no minimum threshold level of exposure or duration of exposure has been identified with regard to the risk of pathologies associated with chrysotile, except for asbestosis."

141. The introduction of *any* source of asbestos, above the trace background amounts, into the environment has been shown to create a significant increase in the risk of mesothelioma. For example, a recent article examining the incidence of mesothelioma in six Egyptian neighborhoods surrounding a plant that used chrysotile asbestos found 83 cases representing a "26-fold excess risk of pleural mesothelioma due to environmental exposure."[248] The levels of asbestos in these neighborhoods was very low — 1.7 of the mesothelioma cases occurred in a neighborhood a half a mile away from the plant where airborne asbestos the dust was measured at 0.04 f/cc. An additional 27 mesothelioma cases occurred in neighborhoods between 1 and 2.5 kilometers away with a dust measurement of

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[248] Madkour et al., *Environmental exposure to asbestos and the exposure-response relationship with mesothelioma.* East Mediterr. Health J. 15(1): 25–38 (Jan 2009).

0.025 f/cc or less. Other studies have shown similar risks. Azuma[249] compared mesothelioma rates and environmental exposure levels at different periods in Japan and predicted that the "cumulative number of deaths from mesothelioma due to environmental asbestos exposure would be around 13,000–30,000 by 2039"; a study by Pan supported the hypothesis that residential proximity to naturally occurring deposits of asbestos in California is significantly associated with an increased risk of mesothelioma.[250] The United States Environmental Protection Agency has noted that, because of the nature of asbestos and its interaction in the human body, each exposure increases the likelihood of developing an asbestos-related disease.[251]

142. Attempts to postulate thresholds or safe levels for exposure to asbestos have been dismissed as "logical nonsense."[252] The lack of a defined "safe level for exposure to asbestos is supported by

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[249] Azuma et al., *Mesothelioma risk and environmental exposure to asbestos: past and future trends in Japan*. Intl. J. Occup. Environ. Health.; 15(2): 166–72 (Apr 2009).

[250] Pan et al., *Residential Proximity to Naturally Occurring Asbestos and Mesothelioma Risk in California*. Am. J. Respir. Crit. Care Med. (2004); 172:1019–25 (2005).

[251] Environmental Protection Agency. A Guide for Ship Scrappers; Tips for Regulatory Compliance. Environmental Protection Agency; Report No.: 315-13-.00-001 (2000).

[252] Hodgson et al., *The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure*. Ann. Occup. Hyg. 44(8):565–601 (Dec 2000).

research, including both epidemiology and medical journal reports. For example, a large French study recently concluded that substantial excess mortality occurs at exposure levels below current regulatory levels.[253] The National Research Council Committee on Non-Occupational Health Risks of Asbestiform Fibers found background environmental exposure of 0.0004 f/cc over a 73 year lifetime (which results in a cumulative dose of 0.03 f/cc-y) was associated with 9 cases of mesothelioma per million. A "higher" exposure of 0.002 fibers/cc (which results in a cumulative dose of 0.146 f/cc-y) was associated with 46 cases of mesothelioma per million — a five-fold risk[254]. A recent study examining the relationship between historical asbestos use and disease rates further supports the conclusion that a linear dose-response

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[253] Iwatsubo et al., *Pleural mesothelioma: dose-response relation at low levels of asbestos exposure in a French population-based case-control study*. Am. J. Epidem. 148(2):133–42 (Jul 15 1998). Indeed, Iwatsubo et al. (1998) found that attempts to quantify the minimum dose of asbestos that will result in mesothelioma through epidemiology have demonstrated that [a] significant excess of mesothelioma was observed far below the limits adopted in most industrial countries during the 1980s."; Rödelsperger et al. *Asbestos and man-made vitreous fibers as risk factors for diffuse malignant mesothelioma: results from a German hospital-based case-control study*. Am. J. Ind. Med.; 39(3):262–75 (Mar 2001).

[254] Asbestiform Fibers Nonoccupational Health Risks, Committee on Non-Occupational Health Risks of Asbestiform Fibers, Board on Toxicology and Environmental Health Hazards, Commission on Life Sciences, National Research Council, National Academy Press, Washington, D.C. (1984).

relationship exists between exposure to asbestos and disease and that no "safe" level of exposure exists.[255]

143. Expert consensus is that studies have shown that any identified occupational, domestic, or environmental exposure to asbestos increase the risk of mesothelioma.[256]

144. In determining cause and effect, physicians and scientific researchers typically look at two

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[255] Lin, R.T. et al., *Ecological association between asbestos.-related diseases and historical asbestos consumption: cm international analysis*. Lancet. 369(9564):844-9 (Mar 10 2007).

[256] Pan et al., *Residential Proximity to Naturally Occurring Asbestos and Mesothelioma Risk in California*. Am. J. Respir. Crit. Care Med. (2004); 172:1019-25 (2005); Iwatsubo et al., *Pleural Mesothelioma: dose-response relation at low levels of asbestos exposure in a French population-based case-control study*. Am. J. Epidem. 148(2):133–42 (Jul. 15, 1998); Rödelsperger et al., *Asbestos and man-made vitreous fillers. as risk factors for diffuse malignant mesothelioma: results from a German hospital-based case-control study*. Am. J. Ind, Med.; 39(3):262–75 (Mar 2001); Skarnmetitz et al., *Asbestos Exposure and Survival in Malignant Mesothelioma; A. Description of 122 Consecutive Cases at an Occupational Clinic*. 2(4) J. Occup. & Environ. Med. 228, 228–29 (Oct. 2011) (noting that for some patients the total asbestos exposure was "a few days"); Newhouse et al,, *Mesothelioma of Pleura and Peritoneum Following Exposure to Asbestos in the London Area*. 22(4) Br. J. Ind. Med, 261, 261–66 (1965) (two cases with 2 months or less exposure to asbestos); Borow et al., *Critical Review, Mesothelioma following Exposure to Asbestos: review of 72 Cases*. 64(5) Chest J. 641 (1973); Greenberg & Davies, supra note 2; Workplace Exposure to Asbestos: Review and Recommendations (DHHS (NIOSH) pub. no. 81-103, Apr. 1980) ("Studies of duration of exposure suggest that even at very short exposure periods (1 day to 3 months) significant disease can occur").

distinct issues, general causation and specific causation. General causation focuses on the issue of whether a particular substance is capable of causing a particular injury or condition in the general population. Specific causation, on the other hand, addresses the issue of whether an exposure to a substance or substances has caused or contributed to the development of a particular individual's injury or disease. To determine general causation, researchers evaluate a variety of data sets including animal studies, toxicology studies, human cellular toxicology studies, molecular studies, case reports, epidemiologic case-control and cohort studies and general biologic principles. If a review of these data sets establishes that there is a general cause and effect relationship, physicians then determine specific causation by ascertaining whether an exposure caused or contributed to a particular individual's disease.

145. As an overall model for determining causality, the considerations espoused by Sir Austin Bradford Hill are well accepted and have been widely used by epidemiologists and scientists of other disciplines.[257] They are: temporality, biologic gradient (dose-response), consistency, biologic plausibility, strength of association, analogy, experimental evidence, coherence and specificity. The scope of medical evidence that substantiate these considerations is both comprehensive and widely inclusive of all the

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[257] Hill, *The Environment and disease: association or causation?* 58(5) Proc. Royal Soc. Med, 295, 299 (1965).

available data. The empirical support for the considerations over such a large epistemological landscape represents, in itself, the ultimate merit of the considerations. The Hill Criteria are generally accepted but Hill himself recognized that no one factor was dispositive and that all the evidence matters, nor did all need to be met.

146. The fact that any one consideration or piece of scientific evidence can always be subject to criticism reinforces the need for consideration of all forms of scientific evidence. As Hill noted, "None of my nine view points can bring indisputable evidence for or against the cause-and-effect hypothesis, and none can be required as a *sine qua non*." Before applying this framework to the issue of whether exposure to chrysotile asbestos causes or contributes to cause mesothelioma, it is important to reflect upon the relative significance of each of these considerations in making such a determination. None of Hill's considerations require statistical epidemiologic data in the sense that that term is used to describe statistical analysis to the exclusion of observational epidemiology.

147. Lemen (2004), using the Bradford Hill considerations, reviewed the evidence for chrysotile's ability to cause mesothelioma and concluded that chrysotile exposure increased the risk of mesothelioma in humans.[258] IARC's most recent review also concludes, using the Bradford

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[258] Lemon, *Chrysotile Asbestos as a Cause of Mesothelioma: Application of the Hill Causation Model*. Int. J. Occup. Environ. Health. 10:233–239 (2004).

Hill considerations, that chrysotile is a cause of pleural and peritoneal mesothelioma, lung cancer and asbestosis, among other diseases.[259] When it comes to looking at cause and effect through epidemiology, IARC noted important limitations:

> When several epidemiological studies show little or no indication of an association between an exposure and cancer, a judgment may be made that, in the aggregate, they show evidence of lack of carcinogenicity. Such a judgment requires first that the studies meet, to a sufficient degree, the standards of design and analysis described above. Specifically, the possibility that bias, confounding or misclassification of exposure or outcome could explain the observed results should be considered and excluded with reasonable certainty. In addition, all studies that are judged to be methodologically sound should (a) be consistent with an estimate of effect of unity for any observed level of exposure, (b) when considered together, provide a pooled estimate of relative risk that is at or near to unity, and (c) have a narrow confidence interval, due to sufficient population size. Moreover, no individual study nor the pooled results of all the studies should show any consistent tendency that the relative risk of cancer increases with increasing level of

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[259] IARC. Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite And Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

> exposure. It is important to note that evidence of lack of carcinogenicity obtained from several epidemiological studies can apply only to the type(s) of cancer studied, to the dose levels reported, and to the intervals between first exposure and disease onset observed in these studies. Experience with human cancer indicates that the period from first exposure to the development of clinical cancer is sometimes longer than 20 years; latent periods substantially shorter than 30 years cannot provide evidence for lack of carcinogenicity.[260]

148. It is important to note that evidence of lack of carcinogenicity obtained from several epidemiological studies can apply only to the type(s) of cancer studied, to the dose levels reported, and to the intervals between first exposure and disease onset observed in these studies. Experience with human cancer indicates that the period from first exposure to the development of clinical cancer is sometimes longer than 20 years; latent periods substantially shorter than 30 years cannot provide evidence for lack of carcinogenicity.

149. "Strength of association" is a reflection of the power of a study. Human epidemiologic studies are not the only source of information type of data available to access this consideration. This consideration can be determined from human,

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[260] IARC, Monograph 100C: Asbestos (Chrysotile, Arnosite, Crocidolite, Actinolite And Anthophyllite), Lyon: International Agency for Research on Cancer (2012) at page 22.

animal or microbiologic studies. The relevance of this consideration is limited by the prevalence of co-factors that may interfere with the measurement of the factor, that is being studied. Strength of association is not a measure of the importance of a particular factor in causation.[261] It is a gauge of potential errors due to confounding or bias. Studies with large rate ratios are less likely to contain errors attributable to bias or confounding. Causal factors with "relatively low rate ratios" may be equally or more important than strong associations from a public health perspective. In addition, a rate ratio of two is not required to establish that a factor contributed to a disease in a particular individual (specific causation). For example, chronic smoking of less than a pack a day induces less than a two fold increase in the risk of heart disease. Nonetheless, it is a universal opinion of physicians that smoking contributes to a smoker's heart disease if he/she smoked at this rate. In fact smoking is a contributing cause of death for about 400,000 people annually but "only" contributes to fewer than 100,000 cases of lung cancer each year. The same is true of second-hand or environmental tobacco smoke. The consensus of the medical community is that second-hand smoke causes cancer and other diseases notwithstanding the fact that the pooled risk estimate of the risk of lung cancer caused by

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[261] Rothman, K.J. Causal Inference — Lanes, S.F.: Error and uncertainty in causal inference. In Causal Inference, pp. 182–183.

second hand smoke is approximately 1.3.[262] Most elevations of blood cholesterol that require medical treatment do not double the risk of heart disease. Furthermore, physicians, when treating a patient for a heart attack, will indicate that previous smoking of a half pack of cigarettes per day for 30 years, family history of heart disease (nongenetic), history of elevated cholesterol of 250 mg/di are all contributing causes of their patient's heart attack. Considered by themselves, none of these factors have an elevated rate ratio greater than two. Epidemiological studies can, when evaluated together, provide more confidence in an association even in the absence of a "statistically significant" finding from any individual study. Greenland states,

> ... *lack of 'statistical significance' is not evidence of a lack of hazard . . . a claim by an expert that 'statistical significance' or 'nonsignificance' demonstrates presence or absence of causation should serve as a warning to the court that said expert is*

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[262] U.S. Department of Health and Human Services. The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, (2006) (Surgeon General finding that a 20–30% increase in risk was sufficient to infer causation of lung cancer from secondhand tobacco smoke at p. 445).

incompetent in the use of statistics for causal inference.[263]

150. Consider, for example, five different political polls that indicate that one of the candidates for office is ahead by between two and three points, a finding that is within the "sampling error" of each individual poll (non-statistically significant in each individual poll). It may be reasonable to conclude that the candidate was going to win on a more likely than not basis, since there are other types of statistical analysis that may allow for such conclusions.

151. Recent epidemiologic studies have showed strong associations between chrysotile asbestos and mesothelioma. [264]

152. After delineating each of his nine points, Hill's final emphasis placed responsibility on scientists for making causal judgments without blind (in fact without any) reliance on "statistical tests."

153. Hill explained his consideration as follows:

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[263] *See* Declaration of Professor Sander Greenland, taken on June 11, 2001.

[264] *E.g.*, Elliott et al., *Lung cancer mortality in North Carolina and South Carolina chrysotile asbestos textile workers.* Occup. Environ. Med. dol:10.1136 (2012); Loomis et al., *Lung cancer mortality and fiber exposures among North Carolina asbestos textile workers.* Occup. Environ. Med. 66:535–542 (2009); Mirabelli et al., *Excess of mesotheliomas utter exposure to chrysotile in Balangero, Italy.* Occup, Environ. Med. 65:815–819 (2008); Memo et al., *Mortality experience, in an historical cohort of chrysotile asbestos textile workers.* WS-E-03, Paper presented at the Global Asbestos Congress, Waseda University, Tokyo, Japan, November 19–21, 2004.

What they [Hill's nine points] *can do, with greater or less strength, is to help us to make up our minds on the fundamental question- is there any other way of explaining the set of facts before us, is there any other answer equally, or more, likely than cause and eject?* ***No formal tests of significance can answer those questions.*** *Such tests can, and should, remind us of the effects that the play of chance can create, and they will instruct us in the likely magnitude of these effects. Beyond that they contribute nothing to the proof of our hypothesis....The question that I had to answer, by the use of the National Health Insurance records of that lime* [1930] *was this: Do the workers in the cardroom of the spinning mill, who tend the machines that clean the raw cotton, have a sickness experience in any way different from that of other operatives in the same mills who are relatively unexposed to the dust and fibre that were features of the cardroom? The answer was an unqualified 'Yes.' From age 30 to age 60 the cardroom workers suffered over three times as much from respiratory causes of illness whereas from non-respiratory causes their experience was not different from that of the other workers, This pronounced difference with the respiratory causes was derived not from abnormally long periods of sickness but rather from an excessive number of repeated absences from work of the cardroom workers.*

All this has rightly passed into the limbo of forgotten things. What interests me today is this: My results were set out for men and women separately and for half a dozen age groups in 36

tables. So there were plenty of sums. Yet I cannot find that anywhere I thought it necessary to use a test of significance. The evidence was so clear-cut, the differences between the groups were mainly so large, the contrast between respiratory and non-respiratory causes of illness .so specific, that no formal tests could really contribute anything of value to the argument. So why use them?

...some editors of journals will return an article because tests of significance have not been applied. Yet there are innumerable situations in which they are totally unnecessary- because the difference is grotesquely obvious....

Of course I exaggerate. Yet too often I suspect we waste a deal of time, we grasp the shadow and lose the substance. We weaken our capacity 10 interpret data and to take reasonable decisions whatever the value of P. And far too often we deduce no difference' from 'no significant difference.' Like fire, the chi square test is an excellent servant and a had master.[265]

Not every question of causation needs an epidemiological study.

154. Hill recognized that decisions have to be made in the absence of perfect data: "All scientific work is incomplete—whether it be observational or experimental. All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the

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[265] Hill, Bradford. *The Environment and disease: association or causation?* 58(5) Proc. Royal Soc'y Med. 295, 299–300 (1965) (bold and italics added).

knowledge we already have, or to postpone the action that it appears to demand at a given time."[266]

155. It is in this context that the mainstream scientific community has reviewed the literature on asbestos and concluded that asbestos from any source is a cause of mesothelioma in someone with cumulative exposure beyond that of the background exposures sustained by all.[267] "No exposure to asbestos is without risk."[268] Cumulative dose best explains the increased risk of mesothelioma in the population.[269]

156. It is precisely because we understand the limitations of epidemiology and how certain

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[266] Hill, Bradford. *The Environment and disease: association or causation?* 58(5) Proc. Royal Soc'y Med. 295, 299–300 (1965) at page 12.

[267] In this regard, all identifiable exposures of an individual are beyond "background" as a matter of simple logic as they are in excess of the background exposures of that individual: It is a logical impossibility to measure the risk created by "background" exposures sustained by all individuals as there is no unexposed comparison group against which to measure the rate of disease. Put another way, it is fallacious to say that "background" exposures to asbestos are free from danger the risk of such exposures simply cannot be measured on a population basis.

[268] LaDou et al., *The Case for a Global Ban on Asbestos.* Environ. Health Perspectives 118:7 (July, 2010).

[269] 2 Dail & Hammar's Pulmonary Pathology 587 (Joseph F. Tomashefski, Jr. el al, eds., 3d ed. 2008) ("[W]hen there are multiple asbestos exposures, each contributes to cumulative exposure and, hence, to the risk and causation of MM [malignant mesothelioma]."); Bignon et al., *History and Experience of mesothelioma in Europe.* Mesothelioma 36 (Bruce W. Robinson & Phillippe Chahinian eds., 2002).

factors can bias studies toward a lack of statistical significance or finding of a point estimate of no increased risk that we look at the epidemiology of a substance along with the other scientific data described above. Each epidemiological study must be evaluated for its strengths and weaknesses and decisions about cause and effect should only be made on reliable data.

157. It is specifically because the epidemiological and all of the other scientific evidence that chrysotile asbestos causes mesothelioma is so strong that the mainstream scientific community has concluded and I am able to conclude that a mesothelioma in a patient exposed to dust from chrysotile asbestos brakes or clutches (or any other source of chrysotile asbestos) was caused, in whole or in part, by that dust.

158. Until recently, there were no epidemiological studies of people exposed primarily to asbestos from brakes reporting a statistically significant increased risk for mesothelioma, but that was likely a reflection of the fact that few studies were designed to detect such a risk. The collection of poorly done studies had led some industry-funded scientists to conclude that asbestos from brakes is somehow without risk for mesothelioma.[270] As explained by Freeman, et al. (2012), the industry scientists violated the maxim that lack of evidence of causation is not the same as evidence

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[270] Goodman et al. *Mesothelioma and lung cancer among motor vehicle mechanics: a meta-analysis*. Ann. Occup. 48(4):309–26 (2004).

of lack of causation."[271] Freeman critically analyzed the industry position and explained the fallacy of relying upon poorly designed, underpowered analyses to reject causation:

> From this analysis we determined that a minimum sample of 845 cases (assuming one non-frequency matched control for each case) would be required to identify an OR=2.0 with 1—b=0.80 (power) and a=0.05. Even if all of the cases in the Goodman et al. review could be pooled, this would only account for 9.3% of the necessary cases for an adequate study of the influence of occupation in the entire automotive repair industry on the risk of mesothelioma. It is important to note that in relying on the data produced by Paustenbach et al. in their industry sponsored publications, we likely relied on an underestimated number of study subjects needed to accomplish the study goals set forth by Goodman et al. The methods used to detect fiber levels in the air underlying the data reported by Paustenbach et al. systematically miss the shorter (<5 microns in length) fibers that are commonly found in chrysotile containing brake dust samples, and thus underreport the sampled chrysotile fiber levels.
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> It is reasonable to conclude that the "net" of evidence supporting a causal nexus between brake dust exposure and mesothelioma favors

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[271] Freeman et al., *Assessing specific causation of mesothelioma following exposure to chrysotile asbestos containing brake dust.* Int. J. Occup. Envir. Health 18:4 (2012).

causation, and that the weak "strands" indicated by industry scientists as evidence to the contrary either do not exist or are greatly outweighed by the evidence to the contrary.

Thus, the industry scientists ignore the mainstream requirement, as discussed by IARC[272] and others,[273] that "negative" epidemiology should only he relied upon where the studies were adequately powered to detect elevated risk.

159. Roelofs et al. (2013) reported a statistically significant increased risk (Standardized Morbidity Odds Ratio (SMOR) = 2.1 (95% CI = 1.1 – 4.0)) of mesothelioma for "automobile mechanics."[274] People working in "automotive repair and related services" also had statistically significant increased risk of 2.2 (95% CI = 1.2 – 3.9). When considered with all the evidence that asbestos causes human mesothelioma, this study is simply further confirmation of the mainstream position that asbestos from any source can cause mesothelioma in those exposed. While these data are accurate, other potential sources of asbestos

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[272] IARC, Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite And Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

[273] Welch et al., Asbestos exposure causes mesothelioma, but not this asbestos exposure: an amicus brief to the Michigan Supreme Court. Int. J. Occup. Environ. Health. 13:318–327 (2007).

[274] Roelofs et al., *Mesothelioma and Employment in Massachusetts: Analysis of Cancer Registry Data 1988–2003.* Am. J. Indus. Med. (Epub ahead of print 2013).

may be unknown. These finding are consistent with the findings of Welch, et al. (2007).

160. Recently the British Health and Safety Executive (HSE) supported a relatively large epidemiological study of mesothelioma risk in Great Britain. Peto et al. (2010)[275] found that motor mechanics born between 1925 and 1930 and exposed before 30 years of age had a statistically significant increased risk of mesothelioma (Odds Ratio of 26.3, 95% CI 2.1 — 259.9)). These motor mechanics had the highest risk of any of the "low risk industrial" groups of that age.

161. Because many occupations, including mechanics, are exposed to the only practical known cause of mesothelioma, asbestos, it is no wonder the mainstream scientific and medical community concludes "auto brake mechanics are known to be especially at risk of developing asbestos-related diseases."[276]

162 Scientists do not require epidemiological studies of every job category or every product to conclude that the toxic ingredient caused a signature injury of that toxin.[277] As Dr. Selikoff properly

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[275] Peto et al., *Occupational, domestic and environmental mesothelioma risks in Britain — A case-control study.* RR696 (2009).

[276] Ontario Ministry of Labour, Alert: Asbestos Hazard in Vehicle Brake Repair. (Issued April 10, 2013).

[277] Lemen, Asbestos: Risk Assessment, Epidemiology, and Health Effects. Chapter 5 *Epidemiology of Asbestos-Related Diseases and the Knowledge. that Led to What is Known Today,* Boca Raton: Taylor and Francis (2011) at page 170.

stated, "[t]he floating fibers do not respect job classifications."[278] For example, scientists and physicians will have no trouble linking an individual lung cancer to cigarettes in a 5 year Marlboro smoker, even though there are no epidemiological studies of Marlboro-only smokers, even though we know that different cigarettes have different ingredients and even though that individual also smoked Winston, Pall Mall and or other brands at various other points in their life. Similarly, it's unlikely that a physician would think twice about attributing a poisoning death to arsenic in coffee even though there are no epidemiologic studies of people who ingested arsenic in coffee. Thus, even though there are no well-designed epidemiological studies of workers who worked with chrysotite asbestos joint compounds, or other such single exposures, the mainstream medical and scientific community would have no trouble attributing the patient's mesothelioma to this chrysotile exposure.

163. Due to the extensive and longstanding use of asbestos, the ambient air in the United States contains minute amounts of asbestos. These ambient air concentrations are generally known as the "background level." Per the ATSDR,

> For example, 10 fibers are typically present in a cubic meter (fibers/m3) of outdoor air in rural areas. (A cubic meter is about the amount of air that you breathe in 1 hour.)

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[278] Selikoff, I. et al., *Asbestos Exposure and Neoplasia.* JAMA 22–26 (1964).

> Health professionals often report the number of fibers in a milliliter (mL) (equivalent to a cubic centimeter [cm^3]) of air rather than in a cubic meter of air. Since there are one million cm^3 (or one million ML) in a cubic typically would be 0.00001 fibers/mL, of asbestos in air in rural areas. Typical levels found in cities are about 10-fold higher.[279]

164. This "background level" of exposure to asbestos is very low when compared to occupational exposures. For example, if only OSHA fibers (*i.e.* fibers longer than 5 microns) are counted, an exposure at the current OSHA PEI., of 0.1 f/cc over a single eight (8) hour workday would mean a worker would breathe 384,000 fibers as compared to the person in a rural environment who would breathe about 29 fibers every eight (8) hours.[280] Put differently, one day at the current

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[279] U.S. Public Health Service, U.S. Department of Health & Human Services. *Public Health Statement Asbestos CAS#: 1332-21-4*. Atlanta Agency for Toxic Substances and Disease Registry (September 2001).

[280] The ambient air exposures were calculated based on the assumption that a person breathes 12 breaths/minute at rest, each breath is 500 cc of air, so the person breathes 6,000 cc/minute. Over eight hours, a resting person will breathe 2,880,000 cc of air (360,000 cc/hour x 8 hours), 2,880,000 x 0.00001 = 28.8 fibers for every 8 hours breathing ambient air. The OSHA PEL exposures were calculated based on the assumption that a person breathes 16 breaths/minute during moderate work, each breath is 500 cc of air, so the person breathes 8,000 cc/minute. The person would breathe 480,000 cc/hour. At 0.1 f/cc, this person would breath 800 fibers per minute or 48,000 per hour. Over eights hours, a working person will breathe cc of air (480,000 cc/hour x 8 hours) 3,840,000.

OSHA PEL is about 13,000 times the background over the same eight hour workday. It bears noting that someone working with asbestos will receive whatever exposures he/she gets from the sources of asbestos in addition to whatever exposure that person receives from the local "background." It is also important to recognize that for every OSHA fiber counted, there are many more fibers in a given air sample which are not counted under the NIOSH 7400 method.

165. In contrast to the ambient background, one asbestos company official explained the exposures experienced at the 1985 OSHA PEL of 2.0 f/cc:

> In physical terms 2.0 f/cc equals 2,000,000 fibers per cubic meter of air (f/m^3). Humans inhale about one cubic meter of air per hour, depending on the degree of activity. Thus, at this concentration a worker would inhale roughly 16,000,000 fiber 5 microns in length over an 8-hour day disregarding the possibility of an infinite number of shorter fibers being present under some conditions.[281]

166. With respect to background concentrations, it is my opinion that "background" is a vague term that has not been well defined. Regardless of the actual background experienced by any person,

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3,840,000 x 0.00001 = 384,000 fibers every 8 hours at the OSHA PEL of 0.1 f/cc.

[281] Young, B, Union Carbide Internal Correspondence *re Asbestos Exposure Effects. Potential of Non-Insulator Crafts* (June 28, 1985).

any inhalation of asbestos released from a point source would .be above background by definition.

167. In 1999, Hillerdal reported several cases of low level exposure to asbestos and the development of mesothelioma and concluded there might not be a true background rate at which mesothelioma occur.[282] Studies have confirmed that mesothelioma is a relatively new disease and appears to correlate with the rise in usage of asbestos.[283]

168. There much published evidence that neighborhood environmental asbestos exposures can be sufficient to cause mesothelioma. For example, in a study carried out in greater Cairo, Egypt concerning asbestos and the exposure-response relationship with mesothelioma, the study evaluated the prevalence of malignant pleural mesothelioma due to occupational and environmental (non-occupational) exposure to asbestos among persons who worked in the asbestos manufacturing plant and in persons living in an area nearby the plant. Eighty-eight cases of mesothelioma were diagnosed, 87 in the exposed group. The risk of mesothelioma was

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[282] Hillerdal G. *Mesothelioma: cases associated with non-occupational and low dose exposures*. Occup. Environ. Med, 1999;56:505–513.

[283] Mark et al., *Absence of Evidence .for a Significant Background Incidence of Diffuse Malignant Mesothelioma Apart from Asbestos Exposure*. Ann. N.Y. Acad. Sci. 643:196–204 (1991); Strauchen, *Rarity of Malignant Mesothelioma Prior to the Widespread Commercial Introduction of Asbestos: The Mount Sinai Autopsy Experience*. 1883–1910. Am. J. Industr. Med. 1–3 (2011).

stated to be higher in the environmentally exposed group than in other groups and was higher in females than males. The prevalence of mesothelioma increased with increased cumulative exposure to asbestos.[284] Pan et al. found that residential proximity to naturally occurring asbestos showed an independent and dose-response association with mesothelioma risk.[285] Goldberg et al. stated: "there is a real burden of environmental asbestos exposure in industrialized countries that could account for approximately 20% of all mesotheliomas." However, further research was needed. Furthermore, the authors stated the high proportion of female mesothelioma cases with no identifiable asbestos exposure suggested that the burden of environmental asbestos exposure was far from negligible.[286] Therefore, based on the information available, all occupational and bystander exposures to asbestos above the background or ambient levels of asbestos within the latency period have the ability to contribute to the causation of mesothelioma.

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[284] Madkour et al., *Environmental exposure to asbestos-response relationship with mesothelioma.* Eastern Mediterranean Health J. 15:25–38 (2009).

[285] Pan, X.L. et al., *Residential proximity to naturally occurring asbestos and mesothelioma risk in California.* Am. J. Respir. Crit. Care Med. 2005; 172:1019–1025.

[286] Goldberg S, Rey G, Luce D et al., *Possible effect of environmental exposure to asbestos on geographical variation in mesothelioma rates.* Occup. Environ. Med. 2010;67:417–421.

169. I believe that there is a background/ambient level of asbestos exposure that exists in the environment and I do not believe that background/ambient levels of exposure can be proven to cause mesothelioma by the method of comparative epidemiology. This is because there is no unexposed control group. However, if a person sustains asbestos exposures above background/ambient levels of exposure and goes on to develop mesothelioma it is my opinion that all of the exposures above background are significant contributing causes in the development of the mesothelioma. Nevertheless, it is generally accepted in the scientific community that there is no known level of asbestos exposure which has been shown not to contribute to the development of mesothelioma.

170 While epidemiology can tell us what happens in a population of people with similar characteristics, it cannot tell us what happens within each individual within that population. Many environmental carcinogens only produce about 10% cancer in exposed individuals (*i.e.* cigarette smokers), which is similar for asbestos induced mesothelioma in the most heavily exposed population (*i.e.* insulators).[287] Various factors may affect this; one of the more important factors includes genetic or individual susceptibility.[288] Because of the nature of asbestos, the fact that

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[287] Tomatis et al., *The role of asbestos fiber dimensions in the prevention of mesothelioma.* 13(1) Int'l J. Occup. Environ. Health. 64 (2007).

[288] *Id.*

epidemiology has detected an excess risk of mesothelioma at levels of exposure that can be reached in a few days of exposure, and that any occupational, para-occupational or domestic exposure to asbestos is by definition an exposure that is thousands of times greater than the minute levels of asbestos seen in the background ambient air, it is not necessary to quantify an occupational or Para-occupational exposure to asbestos before concluding that it caused or contributed to cause a mesothelioma.

171. In January of 1997, a group of 19 experts from 8 different countries met in Helsinki, Finland "to discuss disorders of the lung and pleura in association with asbestos and to agree upon state-of-the-art criteria for their diagnosis and attribution with respect to asbestos." These experts included pathologists, radiologists, occupational and pulmonary physicians, epidemiologists, toxicologists, industrial hygienists, and clinical and laboratory scientists specializing in tissue fiber analysis. Collectively, the group had "published over 1,000 articles on asbestos and associated disorders."[289]

172. In rendering criteria on the attribution of mesothelioma to asbestos exposure, the Consensus Panel considered the following generally accepted concepts regarding mesothelioma:

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[289] Consensus Report: Asbestos, asbestosis, and cancer: the Helsinki criteria for diagnosis and attribution, Scand. J. Work Environ. Health. 23:311-6 (1997) ("Consensus Report").

- The great majority of mesotheliomas are due to asbestos exposure.
- Mesothelioma can occur in cases with low asbestos exposure. However, very low background environmental exposures carry only an extremely low risk.
- About 80% of mesothelioma patients have had some occupational exposure to asbestos, and therefore a careful occupational and environmental history should be taken.
- An occupational history of brief or low-level exposure should he considered sufficient for mesothelioma to be designated as occupationally related.
- A minimum of 10 years from the first exposure is required to attribute the mesothelioma to asbestos exposure, though in most cases the latency interval is longer (e.g., on the order of 30 to 40 years).
- Smoking has no influence on the risk of mesothelioma.

Consensus Report, at p. 313. Relying on these medical facts, the Consensus Panel concluded that "all types of malignant mesothelioma can be induced by asbestos, with the amphiboles showing greater carcinogenic potency than chrysotile" and that "a history of significant occupational, domestic, or environmental exposure to asbestos will suffice for attribution." *Id.* Significantly, the Helsinki Criteria does not require a quantitative estimate of a patient's asbestos "dose" exceeding some undefined level in order to attribute mesothelioma to a given asbestos exposure. The Helsinki Consensus

conclusion is that chrysotile asbestos causes mesothelioma.

173. Given the strong possibility that all mesotheliomas are related to asbestos exposure, it is no surprise that the Helsinki criteria stated: "very low background environmental exposures carry only an extremely low risk."[290] Low risk is not zero and any addition to the background exposure is significant.

174. As set forth in Welch et al. (2007), the mainstream approach to causation in individual is as follows:

> Examining the question of causation of disease in an individual generally involves four questions: 1) was the individual exposed to a toxic agent 2) does the agent cause the disease present in the individual; 3) was the individual exposed to this substance at a level where disease has occurred in other settings; and 4) have other competing explanations for the disease been excluded?
>
> There is no reasonable dispute regarding Question 2—asbestos causes mesothelioma. Additionally, there are no well-accepted competing explanations in North America regarding mesothelioma that must be excluded, resolving Question 4. As a result, when considering the issue of causation of a mesothelioma, once an occupational or para-

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[290] Consensus Report, Asbestos, asbestosis and cancer: The Helsinki criteria for diagnosis and attribution. Scand. J. Work Environ. Health, 1997; 23:311–316.

occupational exposure to asbestos has been established (Question 1), the sole question remaining for examination is whether the exposure or set of exposures of that individual is similar to exposures that have been documented to cause mesothelioma in others — Question 3. The mainstream scientific community is in consensus regarding the resolution of Question 3. As discussed above, there is no safe level of exposure to asbestos. Even exposure at current regulatory levels results in excess mesotheliomas. Accordingly, the consensus of the scientific community is that any occupational or paraoccupational exposure to asbestos—even "brief or low-level exposures"—must be considered causal in an individual with a mesothelioma.[291]

175. I do not believe that exposure to a ***single*** asbestos fiber is at all likely to cause mesothelioma or any other asbestos related cancer. A single asbestos fiber will not cause non-malignant asbestos disease. I believe that every inhaled *fiber* contributes to the risk of developing mesothelioma. ***From a medical and scientific perspective, in a person with mesothelioma, it is my opinion that the cumulative exposure to asbestos contributes to the total dose of asbestos. The total cumulative exposure combines to cause the risk and ultimately, in someone with the disease, to***

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[291] Welch et al., Asbestos exposure causes mesothelioma, but not this asbestos exposure: an amicus brief to the Michigan Supreme Court. Int. J. Occult. Environ, Health. 13:318–327 (2007).

cause a patient's mesothelioma. These are my medical and scientific opinions. I am not offering legal opinions about whether an exposure is "significant" or "substantial" within the meaning of the law. I can only offer opinions about the *medical* and *scientific* significance of an exposure. It must be remembered that an "exposure" is never a single fiber; as discussed below, when someone breathes visible dust from an asbestos product, there millions or billions of asbestos fibers present.

176. Lung cancer and mesothelioma occur when asbestos fibers such as those described above cause genetic errors in epithelial cells lining the airways, or in mesothelial cells that form the lining of the pleural and peritoneal cavities. All the types of asbestos fibers, including chrysotile, have been shown to cause the chromosomal rearrangements and aneuploid condition that can lead to neoplastic transformation of epithelial and mesothelial cells. Asbestos damages DNA and causes cancers in both animal models and humans.

177. It is clear that multiple errors take place before cells are committed to developing cancerous clones. The damage to DNA may occur as soon as the fibers reach the target cells. In the case of mesothelioma, fibers that are transported to the pleura within hours or days after each exposure are taken up by the mesothelial cells and can rapidly cause genetic errors. If those errors are in genes that control cell growth, the door to the development of cancer has opened.

178. In an individual who has been diagnosed with a cancer, it is clear that multiple mesothelial cells have accumulated a series of genetic errors over years until one of those cells, with the required set of mutations for that individual, loses control of normal growth and grows out as a clone into a deadly malignant mesothelioma. Cells with genetic errors are routinely removed from the body by natural defense mechanisms, but it takes only one epithelial or mesothelial cell with sufficient errors to escape detection and form the clone that brings the individual to the clinic, usually two to six decades after the first asbestos exposure. Some mesotheliomas have been shown to develop quickly after asbestos exposures, most likely because of an increased susceptibility to developing genetic errors, or because of a reduced capacity to repair genetic damage, or, perhaps very high levels of exposure. Each exposure to asbestos contributes to the development of the disease process, be it lung scarring, lung cancer, or mesothelioma. A few cases of mesothelioma have been reported with less than ten years of latency.[292]

179. Asbestos exposure often involves extremely small fibers released and inhaled in large amounts. But these enormously large amounts look, on paper, deceptively small. Even at so-called "low" exposure rate — e.g., 0.01 .fibers per cubic centimeter (f/cc), ten times lower than the current OSHA permissible exposure limit (PEL) of 0.1 f/cc

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[292] Selikoff and Lee, *Asbestos and Disease*. Academic Press p. 265 (1978).

— an unprotected person may inhale as many as 80 fibers per minute, 4,800 fibers per hour, 38,400 fibers per day, and 9,600,000 fibers in a 250 day working year. At the current OSHA PEI, of 0.1 flee, each of these numbers would be magnified by a factor of ten resulting in 800 fibers per minute, 48,000 fibers per hour, 384,000 fibers per day, and 96,000.000 fibers in a 250 day working year. And 0.1 f/cc is currently occupational permissible exposure in the United States. Furthermore, it is recognized by OSHA that exposures at a level of 0.1 f/cc-y, excess cancer deaths will occur.[293]

180. A seemingly tiny amount of asbestos is actually a large number of asbestos fibers.

181. As Lemen documents, what some people consider "low level exposures" actually involve surprisingly high numbers of fibers: "Studies conducted by General Motors researchers or brake wear debris demonstrate that 90,000 asbestos fibers per nag remain in that dust [Williams and Muhlbaier. 1980]. Fibers less than 5 min in length outnumber fibers greater than 5 mm in length by a ratio of 300:1. This translates to approximately 300 billion asbestos fibers greater than 5 mm per g of wear debris and 90 trillion asbestos fibers less than 5 mm."[294] In cases of pleural mesothelioma,, the predominant fiber found in the pleura is chrysotile fibers

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[293] *See* Federal Register, Vol. 51, No. 119, June 20, 1986, Table 6, p. 22644.

[294] Lemen, *Asbestos in brakes; exposure and risk of disease.* Am. J. Ind. Med. 45(3):229–237 (2004).

shorter than 5 microns.[295] Numerous studies have demonstrated that mechanics that worked with asbestos-containing brakes without dust control measures were exposed to asbestos dust at levels thousands of times higher than what is seen in the ambient air — particularly when compressed air or dry brushing is used to clean out the wear dust from old asbestos brakes.[296] In addition, the EPA and OSHA and other regulatory agencies throughout the country have issued guidance documents to reduce the risk of disease from asbestos exposure during brake work.[297]

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[295] Suzuki et al., *Asbestos Fibers Contributing to the induction of Human Malignant Mesothelioma.* Ann. N.Y. Acad. Sci. 982:160–176 (2002).

[296] Sakai et al., *Asbestos Exposures During Reprocessing of Automobile Brakes and Clutches.* 12(2) Int. J. Occup. & Environ. Health 95,95–105 (2006); Lorimer et al, *Asbestos exposure of brake repair workers in the United States.* 43(3) Mt. Sinai J. Med. 207, 207–18 (1976); Rohl et al., *Asbestos Exposure During Brake Lining Maintenance and Repair.* 12 Environ. Res, 110, 110–28 (Aug, 1976); D.E. Hickish & K.L. Knight, *Exposure to Asbestos During Brake Maintenance.* 131(1) Ann. of Occup. Hyg. 1–7, 17–21(1970).

[297] *See e.g, Occupational Exposure to Asbestos,* supra note 7; Environmental Protection Agency ("EPA"), *Current Best Practices for Preventing Asbestos Exposure Among Brake and Clutch Repair Workers,* EPA 747-F-04-004 (Mar. 2007); OSHA, *Asbestos-Automotive Brake and Clutch Repair Work. 2006;* SHIB 07-26-2006; Wash. State Department of Labor & Indus., *Working Safely with Asbestos in Clutch and Brake Linings.* F41 3-049-000, Olympia WA, Wash, State Department- of Labor & Indus. (2001); N.H. Pollution Prevention Program, *Pitstops Manual: Best Management Practices for Automobile Service Facilities* (2001); Worksafe Alberta, *Control of asbestos during brake maintenance*

182. In determining the relative contribution of any exposures to asbestos above background levels, it is important to consider a number of factors, including: the nature of exposure, the level of exposure and the duration of exposure, whether a product gives off respirable asbestos fibers, the level of exposure, whether a person was close to or far from the source of fiber release, how frequently the exposure took place and how long the exposure lasted, whether engineering or other methods of dust control were in place, and whether respiratory protection was used.

183. I utilize a linear dose-response model for risk assessment that has been used by OSHA, NIOSH and other governmental entities for more than two decades, to reach my opinion that a patient's mesothelioma was caused by his/her total and cumulative exposure to asbestos. The linear dose-response model is a conservative model and some risk assessments show a supralinear dose response (*i.e.* there is a greater per unit risk at lower doses).[298] As discussed above, I rely upon the *methodology* of attribution espoused in the *Consensus Report, Asbestos, Asbestosis, and*

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and repair, Department of Human Res. & Empl. Gov't of Alberta (2004); Minn. Pollution Control Agency, *Facts About Controlling Brake Dust to Protect Your Health, What Every Mechanic Should Know (1998).*

[298] Berman et al, *Update of Potency Factors for Asbestos-Related Lung Cancer and Mesothelioma*, Crit. Rev. Toxicol. 38: (Suppl 1)1–47 (2008). These author recognized if the true exposure response for mesothelioma is supra linear, this would have important implications for efforts to estimate risk from low exposures," *Id.* at 13.

Cancer: The Helsinki criteria or diagnosis and attribution, commonly known as the "Helsinki Criteria", as applied to the factual evidence of a patient's exposures.[299]

184. It is my opinion that mesothelioma is a dose-response disease and that the resulting disease is the cumulative result of all of the exposures to asbestos that a person receives. The cumulative exposure that a mesothelioma patient has received in their lifetime has caused impact to the lungs, has overwhelmed the body's defense mechanisms, brought about genetic changes, and has caused mesothelioma or other cancers at whatever site it develops.

185. This process takes place as fibers inhaled into the lungs are transported to the pleura or other tissue and cause injury there, including injury to the mesothelial cells, regeneration of mesothelial cells, and genetic changes to mesothelial cells caused by interaction between the asbestos fibers and the chromosomes of those individual cells. Eventually in a person who develops a mesothelioma, there will be a conversion of one or more of those mesothelial cells to a malignant phenotype, which then eventually grows into a tumor that presents clinically as a mesothelioma.

186. The more asbestos fibers that are inhaled into the lung the more likely it is that more of them will

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[299] Consensus Report, Asbestos, Asbestosis, and Cancer: The Helsinki criteria for diagnosis and attribution, Scan J. Work Environ Health, 23:311-6 (1997). While I do not agree with every sentence of the Helsinki Criteria, I do agree with the approach to attribution of causation set forth therein.

be translocated to the pleura. Of course, some of the fibers inhaled may be removed by the mucociliary escalator, some fibers will be deposited in the alveolar spaces and some may be taken up by macrophages. Other fibers may work their way into the interstitium or make their way to the lymph nodes. But there are fibers from each exposure that make their way to the pleura, which is comprised of mesothelial cells — the target cells for mesothelioma. Additionally, asbestos fibers that do not reach the tumor site can and do release cytokines that affect cell division. Because cancer is, at its simplest definition, uncontrolled cell divisions, even asbestos fibers that do not reach the tumor site may play a role in causing cancer.

187. If a person is exposed to less asbestos fibers, then there will be fewer fibers that ultimately make their way to the pleura. Conversely, if a person is exposed to more asbestos fibers, there will be more fibers that make their way to the pleura. This is the nature of the dose-response relationship between asbestos exposure and mesothelioma; the more asbestos exposure a person has, the greater his/her chance of developing mesothelioma. In a person who develops mesothelioma, that disease is the result of the cumulative amount of asbestos and the risk of getting the disease increases with each exposure.

188. This affidavit represents a summary of my opinions based on my education.

189. , training, and experience and on the literature and documents cited. While I do not agree with every sentence of every document cited therein, these publications are authoritative for the propositions for which I cited them. Many of these articles, publications, and documents are cited by myself and other authors in published, peer-reviewed publications. I believe that these publications are generally reliable, although I may not agree with every sentence in a publication, and are of the type relied upon by legitimate experts in asbestos and asbestos-related disease.

/s/Arthur L. Frank

SWORN TO AND SUBSCRIBED
before me this 10th day of Dec. 2013
/s/Patricia A. Buck
NOTARY PUBLIC
My commission expires: June 22, 2015
(SEAL)

IN THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA

JOHN B. DEVRIES, ET AL.,	:	CONSOLIDATED UNDER MDL 875
Plaintiffs,	:	
v.	:	
GENERAL ELECTRIC COMPANY, ET AL.,	:	E.D. PA CIVIL ACTION NO. 5:13-00474-ER
Defendants.	:	

ORDER

AND NOW, this **1st day of October, 2014**, it is hereby **ORDERED** that the Motion for Summary Judgment of Defendant Warren Pumps (Doc. No. 263) is **GRANTED**.[1]

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[1] This case was removed in January of 2013 from the Court of Common Pleas of Philadelphia to the United States District Court for the Eastern District of Pennsylvania as part of MDL-875.

Plaintiff alleges that he was exposed to asbestos while serving in the U.S. Navy during the time period of 1957 to 1960. Plaintiff alleges that Defendant Warren Pumps ("Warren" or "Warren Pumps") manufactured pumps used aboard ships. The alleged

asbestos exposure pertinent to Defendant Warren occurred while Plaintiff was aboard the following ship:

- *USS Turner*

Plaintiff asserts that he developed an asbestos-related illness as a result of his exposure to Defendant's asbestos-containing products.

Plaintiff brought claims against various defendants. Defendant Warren has moved for summary judgment, arguing that (1) there is insufficient evidence to establish causation with respect to its product(s), and (2) it is entitled to summary judgment on grounds of the bare metal defense.

The parties assert that maritime law applies.

II. Legal Standard

A. Summary Judgment Standard

Summary judgment is appropriate if there is no genuine dispute as to any material fact and the moving party is entitled to judgment as a matter of law. Fed. R. Civ. P. 56(a). "A motion for summary judgment will not be defeated by 'the mere existence' of some disputed facts, but will be denied when there is a genuine issue of material fact." *Am. Eagle Outfitters v. Lyle & Scott Ltd.*, 584 F.3d 575, 581 (3d Cir. 2009) (quoting *Anderson v. Liberty Lobby. Inc.*, 477 U.S. 242, 247–248 (1986)). A fact is "material" if proof of its existence or non-existence might affect the outcome of the litigation, and a dispute is "genuine" if "the evidence is such that a reasonable jury could return a verdict for the nonmoving party." *Anderson*, 477 U.S. at 248.

In undertaking this analysis, the court views the facts in the light most favorable to the non-moving party. "After making all reasonable inferences in the nonmoving party's favor, there is a genuine issue of material fact if a reasonable jury could find for the nonmoving party." *Pignataro v. Port Auth. of N.Y. & N.J.*, 593 F.3d 265, 268 (3d Cir. 2010) (citing *Reliance Ins. Co. v. Moessner*, 121 F.3d 895, 900 (3d Cir. 1997)). While the moving party bears the initial burden of showing the absence of a genuine issue of material fact, meeting this obligation shifts the burden to the non-moving party who must "set forth specific facts showing that there is a genuine issue for trial." *Anderson*, 477 U.S. at 250.

B. The Applicable Law

The parties assert that maritime law applies. Whether maritime law is applicable is a threshold dispute that is a question of federal law, *see* U.S. Const. Art. III, § 2; 28 U.S.C. § 1333(1), and is therefore governed by the law of the circuit in which this MDL court sits. *See Various Plaintiffs v. Various Defendants ("Oil Field Cases")*, 673 F. Supp. 2d 358, 362 (E.D. Pa. 2009) (Robreno, J.). This court has previously set forth guidance on this issue. *See Conner v. Alfa Laval, Inc.*, 799 F. Supp. 2d 455 (E.D. Pa. 2011) (Robreno, J.).

In order for maritime law to apply, a plaintiff's exposure underlying a products liability claim must meet both a locality test and a connection test. *Id.* at 463–66 (discussing *Jerome B. Grubart, Inc. v. Great Lakes Dredge & Dock Co.*, 513 U.S. 527, 534 (1995)). The locality test requires that the tort occur on

navigable waters or, for injuries suffered on land, that the injury be caused by a vessel on navigable waters. *Id.* In assessing whether work was on "navigable waters" (i.e., was sea-based) it is important to note that work performed aboard a ship that is docked at the shipyard is sea-based work, performed on navigable waters. *See Sisson v. Ruby*, 497 U.S. 358 (1990). This Court has previously clarified that this includes work aboard a ship that is in "dry dock." *See Deuber v. Asbestos Corp. Ltd.*, No. 10-78931, 2011 WL 6415339, at *1 n.1 (E.D. Pa. Dec. 2, 2011) (Robreno, J.) (applying maritime law to ship in "dry dock" for overhaul). By contrast, work performed in other areas of the shipyard or on a dock, (such as work performed at a machine shop in the shipyard, for example, as was the case with the Willis plaintiff discussed in *Conner*) is land-based work. The connection test requires that the incident could have "'a potentially disruptive impact on maritime commerce,'" and that "'the general character' of the 'activity giving rise to the incident' shows a 'substantial relationship to traditional maritime activity.'" *Grubart*, 513 U.S. at 534 (citing *Sisson*, 497 U.S. at 364, 365, and n.2).

Locality Test

If a service member in the Navy performed some work at shipyards (on land) or docks (on land) as opposed to onboard a ship on navigable waters (which includes a ship docked at the shipyard, and includes those in "dry dock"), "the locality test is satisfied as long as some portion of the asbestos exposure occurred on a vessel on navigable waters." *Conner*, 799 F. Supp. 2d at 466; *Deuber*, 2011 WL 6415339, at *1 n.1. If, however, the worker never

sustained asbestos exposure onboard a vessel on navigable waters, then the locality test is not met and state law applies.

Connection Test

When a worker whose claims meet the locality test was primarily sea-based during the asbestos exposure, those claims will almost always meet the connection test necessary for the application of maritime law. *Conner*, 799 F. Supp. 2d at 467–69 (citing *Grubart*, 513 U.S. at 534). This is particularly true in cases in which the exposure has arisen as a result of work aboard Navy vessels, either by Navy personnel or shipyard workers. *See id.* But if the worker's exposure was primarily land-based, then, even if the claims could meet the locality test, they do not meet the connection test and state law (rather than maritime law) applies. *Id.*

The alleged exposures pertinent to Defendant occurred aboard a ship. Therefore, these exposures were during sea-based work. *See Conner*, 799 F. Supp. 2d 455; *Deuber*, 2011 WL 6415339, at *1 n.1. Accordingly, maritime law is applicable to Plaintiff's claims against Defendant. *See id.* at 462–63.

C. Bare Metal Defense Under Maritime Law

This Court has held that the so-called "bare metal defense" is recognized by maritime law, such that a manufacturer has no liability for harms caused by – and no duty to warn about hazards associated with – a product it did not manufacture or distribute. *Conner v. Alfa Laval, Inc.*, 842 F. Supp. 2d 791, 801 (E.D. Pa. 2012) (Robreno, J.).

D. Product Identification/Causation Under Maritime Law

In order to establish causation for an asbestos claim under maritime law, a plaintiff must show, for each defendant, that "(1) he was exposed to the defendant's product, and (2) the product was a substantial factor in causing the injury he suffered." *Lindstrom v. A-C Prod. Liab. Trust*, 424 F.3d 488, 492 (6th Cir. 2005); citing *Stark v. Armstrong World Indus., Inc.*, 21 F. App'x 371, 375 (6th Cir. 2001). This Court has also noted that, in light of its holding in *Conner*, 842 F. Supp. 2d 791, there is also a requirement (implicit in the test set forth in *Lindstrom* and *Stark*) that a plaintiff show that (3) the defendant manufactured or distributed the asbestos-containing product to which exposure is alleged. *Abbay v. Armstrong Int'l., Inc.*, No. 10-83248, 2012 WL 975837, at *1 n.1 (E.D. Pa. Feb. 29, 2012) (Robreno, J.).

Substantial factor causation is determined with respect to each defendant separately. *Stark*, 21 F. App'x. at 375. In establishing causation, a plaintiff may rely upon direct evidence (such as testimony of the plaintiff or decedent who experienced the exposure, co-worker testimony, or eye-witness testimony) or circumstantial evidence that will support an inference that there was exposure to the defendant's product for some length of time. *Id.* at 376 (quoting *Harbour v. Armstrong World Indus., Inc.*, No. 90-1414, 1991 WL 65201; at *4 (6th Cir. April 25, 1991)).

A mere "minimal exposure" to a defendant's product is insufficient to establish causation. *Lindstrom*, 424

F.3d at 492. "Likewise, a mere showing that defendant's product was present somewhere at plaintiff's place of work is insufficient." *Id.* Rather, the plaintiff must show "'a high enough level of exposure that an inference that the asbestos was a substantial factor in the injury is more than conjectural.'" *Id.* (quoting *Harbour*, 1991 WL 65201, at *4). The exposure must have been "actual" or "real", but the question of "substantiality" is one of degree normally best left to the fact-finder. *Redland Soccer Club. Inc. v. Dep't of Army of U.S.*, 55 F.3d 827, 851 (3d Cir. 1995). "Total failure to show that the defect caused or contributed to the accident will foreclose as a matter of law a finding of strict products liability." *Stark*, 21 F. App'x at 376 (citing *Matthews v. Hyster Co., Inc.*, 854 F.2d 1166, 1168 (9th Cir. 1988) (citing Restatement (Second) of Torts, § 402A (1965))).

III. Defendant Warren Pumps's Motion for Summary Judgment

A. Defendant's Arguments

Product Identification/Causation

Warren Pumps contends that Plaintiff's evidence is insufficient to establish that any product for which it is responsible caused the illness at issue.

Bare Metal Defense

Warren Pumps asserts that it has no duty to warn about and cannot be liable for injury arising from any product or component part that it did not manufacture or supply.

B. Plaintiff's Arguments

Product Identification / Causation / Bare Metal Defense

Plaintiff contends that he has identified sufficient product identification/causation evidence to survive summary judgment. In support of this assertion, Plaintiff cites to the following evidence, which Plaintiff represents is as follows:

- Deposition of Plaintiff

  Plaintiff testified that he worked aboard the *USS Turner* in the two engine and two fire rooms. He testified that he worked around every pump in each of four rooms, while it was being repacked. He testified that he was exposed to respirable dust from packing and sometimes insulation on each of the pumps. He identified three main brands of pumps in those rooms: Warren, Buffalo, and DeLaval.

  (Pl. Ex. A, Doc. No. 301.)

- Various Documents

  Plaintiff points to various documents and testimony to establish the following: (1) Warren supplied several pumps for the ship at issue, (2) Warren supplied its pumps with asbestos-containing insulation, gaskets, and packing, and (3) Warren arranged for asbestos lagging to be used on at least one of the pumps aboard the ship.

  (Pl. Exs. B to D, Doc. Nos. 301 and 301-1.)

- Expert Affidavit of Arthur Faherty

  Expert Arthur Faherty provides testimony that (1) "Generally, if a company supplied asbestos with its equipment, some of that asbestos was always present unless the record shows that the asbestos installed by the defendant was entirely, removed," and (2) "The removal of the entire initial asbestos never occurred."

  (Pl. Ex. E, Doc. No. 301-1 at ¶¶ 44–45.)

- Expert Affidavit of Capt. R. Bruce Woodruff

  Expert Capt. Woodruff discusses the fact that assessment and overhaul of the *USS Turner* occurred in the period 1957 to 1960 and that a recommendation was made in 1957 to replace 75% of the lagging in the engineering spaces during an overhaul in 1960.

  (Pl. Ex. E, Doc. Nos. 301-1 and 301-2)

With respect to the so-called "bare metal defense," Plaintiff contends that, where a Defendant supplied a product with original asbestos-containing components parts (or accompanying external insulation), the burden is on Defendant to establish that all of this original asbestos was removed prior to Plaintiff's exposure to the product. According to Plaintiff, in the absence of such proof by Defendant, there is a fact question as to whether any of the original asbestos was still present at the time of his alleged exposure.

C. Analysis

Plaintiff alleges that he was exposed to asbestos from packing and insulation used in connection with Warren pumps. There is evidence that Warren pumps were aboard the ship on which Plaintiff worked. There is evidence that Warren supplied asbestos-containing gaskets, packing, and insulation with these pumps. There is evidence that, during the period 1957 to 1960, Plaintiff was exposed to respirable dust from gaskets inside these pumps, and from external insulation on some of these pumps.

Importantly, however, there is no evidence that Plaintiff was exposed to respirable asbestos dust from packing or insulation supplied by Warren (either as an original part or a replacement part). Although Plaintiff points to expert evidence to support his contention that some of the original asbestos material supplied by Warren was still present on the ship at the time of Plaintiff's alleged exposure, this evidence is nonetheless impermissibly speculative. Neither expert Faherty nor Captain Woodruff served aboard the ship at issue, and each concedes that at least some of the original asbestos material aboard the ship would have been removed prior to Plaintiff's alleged exposure. The evidence cited by Captain Woodruff that a recommendation was made in 1957 to replace 75% of the lagging on board certain areas of the ship in 1960 does not establish that the lagging had not been previously replace and, in fact, suggests that at least 25% had already been replaced. In fact, Plaintiff concedes that he is not able to establish that he was exposed to original asbestos, and instead contends that the burden is on Defendants to establish that all

original asbestos (or replacement asbestos supplied by Defendant) had been removed from the ship prior to Plaintiff's exposures thereon. The Court has previously rejected this proposition, and has made clear that, under maritime law, the burden is on the Plaintiff to establish exposure to a product manufactured or supplied by Defendant. See *Conner*, 842 F.Supp.2d at 797.

In short, no reasonable jury could conclude from the evidence that Plaintiff was exposed to asbestos from a product manufactured or supplied by Warren such that it was a substantial factor in the development of his illness, because any such finding would be based on conjecture. See *Lindstrom*, 424 F.3d at 492. Accordingly, summary judgment in favor of Defendant is warranted. *Anderson*, 477 U.S. at 248–50.

D. Conclusion

Summary judgment in favor of Defendant is granted with respect to all of Plaintiff's claims against it because Plaintiff has failed to identify sufficient evidence of product identification/causation.

E.D. Pa. No.
5:13-00474-ER

AND IT IS SO ORDERED.

/s/ Eduardo C. Robreno, J.
Eduardo C. Robreno J.

IN THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA

JOHN B. DEVRIES, ET AL.,	:	CONSOLIDATED UNDER MDL 875
Plaintiffs,	:	
v.	:	
GENERAL ELECTRIC COMPANY, ET AL.,	:	E.D. PA CIVIL ACTION NO. 5:13-00474-ER
Defendants.	:	

ORDER

AND NOW, this **1st day of October, 2014**, it is hereby **ORDERED** that the Motion for Summary Judgment of Defendant IMO Industries, Inc. (Doc. No. 273) is **GRANTED**.[1]

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[1] This case was removed in January of 2013 from the Court of Common Pleas of Philadelphia to the United States District Court for the Eastern District of Pennsylvania as part of MDL-875.

Plaintiff alleges that he was exposed to asbestos while serving in the U.S. Navy during the time period 1957 to 1960. Defendant IMO Industries, Inc.'s predecessor, DeLaval Pumps ("DeLaval" or "DeLaval Pumps"), manufactured pumps used aboard ships. The

alleged asbestos exposure pertinent to Defendant occurred while Plaintiff was aboard the following ship:

- *USS Turner*

Plaintiff asserts that he developed an asbestos-related illness as a result of his exposure to Defendant's asbestos-containing products.

Plaintiff brought claims against various defendants. Defendant DeLaval has moved for summary judgment, arguing that (1) there is insufficient evidence to establish causation with respect to its product(s), and (2) it is entitled to summary judgment on grounds of the bare metal defense.

The parties assert that maritime law applies.

II. Legal Standard

A. Summary Judgment Standard

Summary judgment is appropriate if there is no genuine dispute as to any material fact and the moving party is entitled to judgment as a matter of law. Fed. R. Civ. P. 56(a). "A motion for summary judgment will not be defeated by 'the mere existence' of some disputed facts, but will be denied when there is a genuine issue of material fact." *Am. Eagle Outfitters v. Lyle & Scott Ltd.*, 584 F.3d 575, 581 (3d Cir. 2009) (quoting *Anderson v. Liberty Lobby. Inc.*, 477 U.S. 242, 247–248 (1986)). A fact is "material" if proof of its existence or non-existence might affect the outcome of the litigation, and a dispute is "genuine" if "the evidence is such that a reasonable jury could return a verdict for the nonmoving party." *Anderson*, 477 U.S. at 248.

In undertaking this analysis, the court views the facts in the light most favorable to the non-moving party. "After making all reasonable inferences in the nonmoving party's favor, there is a genuine issue of material fact if a reasonable jury could find for the nonmoving party." *Pignataro v. Port Auth. of N.Y. & N.J.*, 593 F.3d 265, 268 (3d Cir. 2010) (citing *Reliance Ins. Co. v. Moessner*, 121 F.3d 895, 900 (3d Cir. 1997)). While the moving party bears the initial burden of showing the absence of a genuine issue of material fact, meeting this obligation shifts the burden to the non-moving party who must "set forth specific facts showing that there is a genuine issue for trial." *Anderson*, 477 U.S. at 250.

B. The Applicable Law

The parties assert that maritime law applies. Whether maritime law is applicable is a threshold dispute that is a question of federal law, *see* U.S. Const. Art. III, § 2; 28 U.S.C. § 1333(1), and is therefore governed by the law of the circuit in which this MDL court sits. *See Various Plaintiffs v. Various Defendants ("Oil Field Cases")*, 673 F. Supp. 2d 358, 362 (E.D. Pa. 2009) (Robreno, J.). This court has previously set forth guidance on this issue. *See Conner v. Alfa Laval, Inc.*, 799 F. Supp. 2d 455 (E.D. Pa. 2011) (Robreno, J.).

In order for maritime law to apply, a plaintiff's exposure underlying a products liability claim must meet both a locality test and a connection test. Id. at 463–66 (discussing *Jerome B. Grubart, Inc. v. Great Lakes Dredge & Dock Co.*, 513 U.S. 527, 534, 115 S.Ct. 1043, 130 L.Ed.2d 1024 (1995)). The locality test

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requires that the tort occur on navigable waters or, for injuries suffered on land, that the injury be caused by a vessel on navigable waters. Id. In assessing whether work was on "navigable waters" (i.e., was sea-based) it is important to note that work performed aboard a ship that is docked at the shipyard is sea-based work, performed on navigable waters. See *Sisson v. Ruby*, 497 U.S. 358, 110 S.Ct. 2892, 111 L.Ed.2d 292 (1990). This Court has previously clarified that this includes work aboard a ship that is in "dry dock." See *Deuber v. Asbestos Corp. Ltd.*, No. 10–78931, 2011 WL 6415339, at *1 n. 1 (E.D.Pa. Dec. 2, 2011) (Robreno, J.) (applying maritime law to ship in "dry dock" for overhaul). By contrast, work performed in other areas of the shipyard or on a dock, (such as work performed at a machine shop in the shipyard, for example, as was the case with the Willis plaintiff discussed in *Conner*) is land-based work. The connection test requires that the incident could have " 'a potentially disruptive impact on maritime commerce,' " and that " 'the general character' of the 'activity giving rise to the incident' shows a 'substantial relationship to traditional maritime activity.' " *Grubart*, 513 U.S. at 534 (citing *Sisson*, 497 U.S. at 364, 365, and n. 2).

Locality Test

If a service member in the Navy performed some work at shipyards (on land) or docks (on land) as opposed to onboard a ship on navigable waters (which includes a ship docked at the shipyard, and includes those in "dry dock"), "the locality test is satisfied as long as some portion of the asbestos exposure occurred on a vessel on navigable waters." *Conner*, 799 F. Supp. 2d at 466; *Deuber*, 2011 WL

6415339, at *1 n.1. If, however, the worker never sustained asbestos exposure onboard a vessel on navigable waters, then the locality test is not met and state law applies.

Connection Test

When a worker whose claims meet the locality test was primarily sea-based during the asbestos exposure, those claims will almost always meet the connection test necessary for the application of maritime law. *Conner*, 799 F. Supp. 2d at 467–69 (citing *Grubart*, 513 U.S. at 534). This is particularly true in cases in which the exposure has arisen as a result of work aboard Navy vessels, either by Navy personnel or shipyard workers. *See id.* But if the worker's exposure was primarily land-based, then, even if the claims could meet the locality test, they do not meet the connection test and state law (rather than maritime law) applies. *Id.*

The alleged exposures pertinent to Defendant occurred aboard a ship. Therefore, these exposures were during sea-based work. *See Conner*, 799 F. Supp. 2d 455; *Deuber*, 2011 WL 6415339, at *1 n.1. Accordingly, maritime law is applicable to Plaintiff's claims against Defendant. *See id.* at 462–63.

C. Bare Metal Defense Under Maritime Law

This Court has held that the so-called "bare metal defense" is recognized by maritime law, such that a manufacturer has no liability for harms caused by – and no duty to warn about hazards associated with – a product it did not manufacture or distribute. *Conner*

v. Alfa Laval, Inc., 842 F. Supp. 2d 791, 801 (E.D. Pa. 2012) (Robreno, J.).

D. Product Identification/Causation Under Maritime Law

In order to establish causation for an asbestos claim under maritime law, a plaintiff must show, for each defendant, that "(1) he was exposed to the defendant's product, and (2) the product was a substantial factor in causing the injury he suffered." *Lindstrom v. A-C Prod. Liab. Trust*, 424 F.3d 488, 492 (6th Cir. 2005); citing *Stark v. Armstrong World Indus., Inc.*, 21 F. App'x 371, 375 (6th Cir. 2001). This Court has also noted that, in light of its holding in *Conner*, 842 F. Supp. 2d 791, there is also a requirement (implicit in the test set forth in *Lindstrom* and *Stark*) that a plaintiff show that (3) the defendant manufactured or distributed the asbestos-containing product to which exposure is alleged. *Abbay v. Armstrong Int'l., Inc.*, No. 10-83248, 2012 WL 975837, at *1 n.1 (E.D. Pa. Feb. 29, 2012) (Robreno, J.).

Substantial factor causation is determined with respect to each defendant separately. *Stark*, 21 F. App'x. at 375. In establishing causation, a plaintiff may rely upon direct evidence (such as testimony of the plaintiff or decedent who experienced the exposure, co-worker testimony, or eye-witness testimony) or circumstantial evidence that will support an inference that there was exposure to the defendant's product for some length of time. *Id.* at 376 (quoting *Harbour v. Armstrong World Indus., Inc.*, No. 90-1414, 1991 WL 65201; at *4 (6th Cir. April 25, 1991)).

A mere "minimal exposure" to a defendant's product is insufficient to establish causation. *Lindstrom*, 424 F.3d at 492. "Likewise, a mere showing that defendant's product was present somewhere at plaintiff's place of work is insufficient." *Id.* Rather, the plaintiff must show "'a high enough level of exposure that an inference that the asbestos was a substantial factor in the injury is more than conjectural.'" *Id.* (quoting *Harbour*, 1991 WL 65201, at *4). The exposure must have been "actual" or "real", but the question of "substantiality" is one of degree normally best left to the fact-finder. *Redland Soccer Club. Inc. v. Dep't of Army of U.S.*, 55 F.3d 827, 851 (3d Cir. 1995). "Total failure to show that the defect caused or contributed to the accident will foreclose as a matter of law a finding of strict products liability." *Stark*, 21 F. App'x at 376 (citing *Matthews v. Hyster Co., Inc.*, 854 F.2d 1166, 1168 (9th Cir. 1988) (citing Restatement (Second) of Torts, § 402A (1965))).

III. Defendant IMO Industries's Motion for Summary Judgment

A. Defendant's Arguments

Product Identification/Causation

Defendant contends that Plaintiff's evidence is insufficient to establish that any product for which it is responsible caused the illness at issue.

Bare Metal Defense

Defendant argues that it has no duty to warn about and cannot be liable for injury arising from any product or component part that it did not manufacture or supply.

B. Plaintiff's Arguments

Product Identification / Causation / Bare Metal Defense

Plaintiff contends that he has identified sufficient product identification/causation evidence to survive summary judgment. In support of this assertion, Plaintiff cites to the following evidence, which Plaintiff represents is as follows:

- Deposition of Plaintiff

  Plaintiff testified that he worked aboard the *USS Turner* in the two engine and two fire rooms. He identified three main brands of pumps in those rooms: Warren, Buffalo, and DeLaval. He testified that he worked around every pump in each of four rooms, while it was being repacked. He testified that he was exposed to respirable dust from packing and sometimes insulation on each of the pumps. He also testified that he was exposed to respirable dust from gaskets on DeLaval pumps.

  (Pl. Ex. E, Doc. No. 297.)

- Various Documents

  Plaintiff points to various documents and testimony to establish the following: (1) DeLaval supplied pumps for the ship at issue, (2) DeLaval supplied those pumps with asbestos-containing gaskets, (3) DeLaval arranged for asbestos insulation to be installed on the pumps, and (3) DeLaval

supplied replacement asbestos gaskets for its pumps aboard the ship.

(Pl. Exs. B to D and F, Doc. Nos. 297 and 297-1.)

- Expert Affidavit of Arthur Faherty

  In connection with its opposition to another pump manufacturer's motion for summary judgment, Plaintiff pointed to the affidavit of expert Arthur Faherty, who provides testimony that (1) "Generally, if a company supplied asbestos with its equipment, some of that asbestos was always present unless the record shows that the asbestos installed by the defendant was entirely, removed," and (2) "The removal of the entire initial asbestos never occurred."

  (Pl. Ex. E, Doc. No. 301-1 at ¶¶ 44–45.)

- Expert Affidavit of Capt. R. Bruce Woodruff

  In connection with its opposition to another pump manufacturer's motion for summary-judgment, Plaintiff pointed to the affidavit of expert Capt. Woodruff, who discusses the fact that assessment and overhaul of the USS Turner occurred in the period 1957 to 1960 and that a recommendation was made in 1957 to replace 75% of the lagging in the engineering spaces during an overhaul in 1960.

  (Pl. Ex. E, Doc. Nos. 301-1 and 301-2)

With respect to the so-called "bare metal defense," Plaintiff contends that, where a Defendant supplied a

product with original asbestos-containing components parts (or accompanying external insulation), the burden is on Defendant to establish that all of this original asbestos was removed prior to Plaintiff's exposure to the product. According to Plaintiff, in the absence of such proof by Defendant, there is a fact question as to whether any of the original asbestos was still present at the time of his alleged exposure.

C. Analysis

Plaintiff alleges that he was exposed to asbestos from gaskets, packing and insulation used in connection with DeLaval pumps. There is evidence that DeLaval pumps were aboard the ship on which Plaintiff worked. There is evidence that DeLaval supplied asbestos-containing gaskets with these pumps, and that it arranged for installation of external asbestos insulation on these pumps. There is also evidence that DeLaval supplied some asbestos replacement gaskets to the ship at issue, for use with its pumps. There is evidence that, during the period 1957 to 1960, Plaintiff was exposed to respirable dust from gaskets (and perhaps packing) inside these pumps, and from external insulation on some of these pumps.

Importantly, however, there is no evidence that Plaintiff was exposed to respirable asbestos dust from gaskets, packing, or insulation supplied by DeLaval (either as an original part or a replacement part). Although Plaintiff points (in connection with his opposition to the motion for summary judgment of Warren Pumps, another pump manufacturer defendant in this action) to expert evidence to support

his contention that some of the original asbestos material supplied by DeLaval was still present on the ship at the time of Plaintiff's alleged exposure, this evidence is nonetheless impermissibly speculative. Neither expert Faherty nor Captain Woodruff served aboard the ship at issue, and each concedes that at least some of the original asbestos material aboard the ship would have been removed prior to Plaintiff's alleged exposure. The evidence cited by Captain Woodruff that a recommendation was made in 1957 to replace 75% of the lagging on board certain areas of the ship in 1960 does not establish that the lagging had not been previously replaced and, in fact, suggests that at least 25% had already been replaced. Moreover, Plaintiff concedes that he is not able to establish that he was exposed to original asbestos, and instead contends that the burden is on Defendants to establish that all original asbestos (or replacement asbestos supplied by Defendant) had been removed from the ship prior to Plaintiff's exposures thereon. The Court has previously rejected this proposition, and has made clear that, under maritime law, the burden is on the Plaintiff to establish exposure to a product manufactured or supplied by Defendant. See *Conner*, 842 F.Supp.2d at 7 97.

In short, no reasonable jury could conclude from the evidence that Plaintiff was exposed to asbestos from a product manufactured or supplied by Warren such that it was a substantial factor in the development of his illness, because any such finding would be based on conjecture. See *Lindstrom*, 424 F.3d at 492. Accordingly, summary judgment in favor of Defendant is warranted. *Anderson*, 477 U.S. at 248–50.

D. Conclusion

Summary judgment in favor of Defendant is granted with respect to all of Plaintiff's claims against it because Plaintiff has failed to identify sufficient evidence of product identification/causation.

E.D. Pa. No.
5:13-00474-ER

AND IT IS SO ORDERED.

/s/ Eduardo C. Robreno, J.
Eduardo C. Robreno J.

IN THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA

JOHN B. DEVRIES, ET AL.,	:	CONSOLIDATED UNDER MDL 875
Plaintiffs,	:	
v.	:	
GENERAL ELECTRIC COMPANY, ET AL.,	:	E.D. PA CIVIL ACTION NO. 5:13-00474-ER
Defendants.	:	

ORDER

AND NOW, this **10th day of October, 2014**, it is hereby **ORDERED** that the Motion for Summary Judgment of Defendant General Electric Company (Doc. No. 270) is **GRANTED**.[1]

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[1] This case was removed in January of 2013 from the Court of Common Pleas of Philadelphia to the United States District Court for the Eastern District of Pennsylvania as part of MDL-875.

Plaintiff alleges that he was exposed to asbestos while serving in the U.S. Navy during the time period of 1957 to 1960. Plaintiff alleges that Defendant General Electric Company ("GE" or "General Electric") manufactured turbines used aboard ships. The

alleged asbestos exposure pertinent to Defendant GE occurred while Plaintiff was aboard the following ship:

- *USS Turner*

Plaintiff asserts that he developed an asbestos-related illness as a result of his exposure to Defendant's products.

Plaintiff brought claims against various defendants. Defendant GE has moved for summary judgment, arguing that (1) there is insufficient evidence to establish causation with respect to its product(s), (2) it is entitled to summary judgment on grounds of the bare metal defense, and (3) it is immune from liability by way of the government contractor defense.

The parties assert that maritime law applies.

II. Legal Standard

A. Summary Judgment Standard

Summary judgment is appropriate if there is no genuine dispute as to any material fact and the moving party is entitled to judgment as a matter of law. Fed. R. Civ. P. 56(a). "A motion for summary judgment will not be defeated by 'the mere existence' of some disputed facts, but will be denied when there is a genuine issue of material fact." *Am. Eagle Outfitters v. Lyle & Scott Ltd.*, 584 F.3d 575, 581 (3d Cir. 2009) (quoting *Anderson v. Liberty Lobby. Inc.*, 477 U.S. 242, 247–248 (1986)). A fact is "material" if proof of its existence or non-existence might affect the outcome of the litigation, and a dispute is "genuine" if "the evidence is such that a reasonable jury could return a verdict for the nonmoving party." *Anderson*, 477 U.S. at 248.

In undertaking this analysis, the court views the facts in the light most favorable to the non-moving party. "After making all reasonable inferences in the nonmoving party's favor, there is a genuine issue of material fact if a reasonable jury could find for the nonmoving party." *Pignataro v. Port Auth. of N.Y. & N.J.*, 593 F.3d 265, 268 (3d Cir. 2010) (citing *Reliance Ins. Co. v. Moessner*, 121 F.3d 895, 900 (3d Cir. 1997)). While the moving party bears the initial burden of showing the absence of a genuine issue of material fact, meeting this obligation shifts the burden to the non-moving party who must "set forth specific facts showing that there is a genuine issue for trial." *Anderson*, 477 U.S. at 250.

B. The Applicable Law

1. Government Contractor Defense (Federal Law)

Defendant's motion for summary judgment on the basis of the government contractor defense is governed by federal law. In matters of federal law, the MDL transferee court applies the law of the circuit where it sits, which in this case is the law of the U.S. Court of Appeals for the Third Circuit. *Various Plaintiffs v. Various Defendants ("Oil Field Cases")*, 673 F. Supp. 2d 358, 362–63 (E.D. Pa. 2009) (Robreno, J.).

2. State Law Issues (Maritime versus State Law)

The parties assert that maritime law applies. Whether maritime law is applicable is a threshold dispute that is a question of federal law, *see* U.S. Const. Art. III, § 2; 28 U.S.C. § 1333(1), and is therefore governed by the law of the circuit in which

this MDL court sits. *See Various Plaintiffs v. Various Defendants ("Oil Field Cases")*, 673 F. Supp. 2d 358, 362 (E.D. Pa. 2009) (Robreno, J.). This court has previously set forth guidance on this issue. *See Conner v. Alfa Laval, Inc.*, 799 F. Supp. 2d 455 (E.D. Pa. 2011) (Robreno, J.).

In order for maritime law to apply, a plaintiff's exposure underlying a products liability claim must meet both a locality test and a connection test. *Id.* at 463–66 (discussing *Jerome B. Grubart, Inc. v. Great Lakes Dredge & Dock Co.*, 513 U.S. 527, 534 (1995)). The locality test requires that the tort occur on navigable waters or, for injuries suffered on land, that the injury be caused by a vessel on navigable waters. *Id.* In assessing whether work was on "navigable waters" (i.e., was sea-based) it is important to note that work performed aboard a ship that is docked at the shipyard is sea-based work, performed on navigable waters. *See Sisson v. Ruby*, 497 U.S. 358 (1990). This Court has previously clarified that this includes work aboard a ship that is in "dry dock." *See Deuber v. Asbestos Corp. Ltd.*, No. 10-78931, 2011 WL 6415339, at *1 n.1 (E.D. Pa. Dec. 2, 2011) (Robreno, J.) (applying maritime law to ship in "dry dock" for overhaul). By contrast, work performed in other areas of the shipyard or on a dock, (such as work performed at a machine shop in the shipyard, for example, as was the case with the Willis plaintiff discussed in *Conner*) is land-based work. The connection test requires that the incident could have "'a potentially disruptive impact on maritime commerce,'" and that "'the general character' of the 'activity giving rise to the incident' shows a 'substantial relationship to traditional

maritime activity.'" *Grubart*, 513 U.S. at 534 (citing *Sisson*, 497 U.S. at 364, 365, and n.2).

Locality Test

If a service member in the Navy performed some work at shipyards (on land) or docks (on land) as opposed to onboard a ship on navigable waters (which includes a ship docked at the shipyard, and includes those in "dry dock"), "the locality test is satisfied as long as some portion of the asbestos exposure occurred on a vessel on navigable waters." *Conner*, 799 F. Supp. 2d at 466; *Deuber*, 2011 WL 6415339, at *1 n.1. If, however, the worker never sustained asbestos exposure onboard a vessel on navigable waters, then the locality test is not met and state law applies.

Connection Test

When a worker whose claims meet the locality test was primarily sea-based during the asbestos exposure, those claims will almost always meet the connection test necessary for the application of maritime law. *Conner*, 799 F. Supp. 2d at 467–69 (citing *Grubart*, 513 U.S. at 534). This is particularly true in cases in which the exposure has arisen as a result of work aboard Navy vessels, either by Navy personnel or shipyard workers. *See id.* But if the worker's exposure was primarily land-based, then, even if the claims could meet the locality test, they do not meet the connection test and state law (rather than maritime law) applies. *Id.*

The alleged exposures pertinent to Defendant occurred aboard a ship. Therefore, these exposures

were during sea-based work. *See Conner*, 799 F. Supp. 2d 455; *Deuber*, 2011 WL 6415339, at *1 n.1. Accordingly, maritime law is applicable to Plaintiff's claims against Defendant. *See id.* at 462–63.

C. Bare Metal Defense Under Maritime Law

This Court has held that the so-called "bare metal defense" is recognized by maritime law, such that a manufacturer has no liability for harms caused by – and no duty to warn about hazards associated with – a product it did not manufacture or distribute. *Conner v. Alfa Laval, Inc.*, 842 F. Supp. 2d 791, 801 (E.D. Pa. 2012) (Robreno, J.).

D. Product Identification/Causation Under Maritime Law

In order to establish causation for an asbestos claim under maritime law, a plaintiff must show, for each defendant, that "(1) he was exposed to the defendant's product, and (2) the product was a substantial factor in causing the injury he suffered." *Lindstrom v. A-C Prod. Liab. Trust*, 424 F.3d 488, 492 (6th Cir. 2005); citing *Stark v. Armstrong World Indus., Inc.*, 21 F. App'x 371, 375 (6th Cir. 2001). This Court has also noted that, in light of its holding in *Conner*, 842 F. Supp. 2d 791, there is also a requirement (implicit in the test set forth in *Lindstrom* and *Stark*) that a plaintiff show that (3) the defendant manufactured or distributed the asbestos-containing product to which exposure is alleged. *Abbay v. Armstrong Int'l., Inc.*, No. 10-83248, 2012 WL 975837, at *1 n.1 (E.D. Pa. Feb. 29, 2012) (Robreno, J.).

Substantial factor causation is determined with respect to each defendant separately. *Stark*, 21 F.

App'x. at 375. In establishing causation, a plaintiff may rely upon direct evidence (such as testimony of the plaintiff or decedent who experienced the exposure, co-worker testimony, or eye-witness testimony) or circumstantial evidence that will support an inference that there was exposure to the defendant's product for some length of time. *Id.* at 376 (quoting *Harbour v. Armstrong World Indus., Inc.*, No. 90-1414, 1991 WL 65201; at *4 (6th Cir. April 25, 1991)).

A mere "minimal exposure" to a defendant's product is insufficient to establish causation. *Lindstrom*, 424 F.3d at 492. "Likewise, a mere showing that defendant's product was present somewhere at plaintiff's place of work is insufficient." *Id.* Rather, the plaintiff must show "'a high enough level of exposure that an inference that the asbestos was a substantial factor in the injury is more than conjectural.'" *Id.* (quoting *Harbour*, 1991 WL 65201, at *4). The exposure must have been "actual" or "real", but the question of "substantiality" is one of degree normally best left to the fact-finder. *Redland Soccer Club. Inc. v. Dep't of Army of U.S.*, 55 F.3d 827, 851 (3d Cir. 1995). "Total failure to show that the defect caused or contributed to the accident will foreclose as a matter of law a finding of strict products liability." *Stark*, 21 F. App'x at 376 (citing *Matthews v. Hyster Co., Inc.*, 854 F.2d 1166, 1168 (9th Cir. 1988) (citing Restatement (Second) of Torts, § 402A (1965))).

III. Defendant General Electric's Motion for Summary Judgment

A. Defendant's Arguments

Product Identification/Causation

Defendant contends that Plaintiff's evidence is insufficient to establish that any product for which it is responsible caused the illness at issue.

Bare Metal Defense

Defendant asserts that it has no duty to warn about and cannot be liable for injury arising from any product or component part that it did not manufacture or supply.

Government Contractor Defense

Defendant asserts the government contractor defense, arguing that it is immune from liability in this case because the Navy exercised discretion and approved the warnings supplied by Defendant for the products at issue, Defendant provided warnings that conformed to the Navy's approved warnings, and the Navy knew about asbestos and its hazards.

B. Plaintiff's Arguments

Product Identification / Causation / Bare Metal Defense

Plaintiff contends that he has identified sufficient product identification/causation evidence to survive summary judgment. In support of this assertion, Plaintiff cites to the following evidence, which Plaintiff represents is as follows:

- Deposition of Plaintiff

Plaintiff testified that he worked aboard the *USS Turner* in the two engine and two fire rooms. He testified that there were two GE turbines aboard the ship. He testified that he was present when repair work was being done on these turbines, releasing dust from the external insulation.

(Pl. Ex. A, Doc. No. 294.)

- GE specification for Heat Insulation Material

  Plaintiff points to a single document for his assertion that GE required (and perhaps also arrange for) asbestos on its turbines. The document, which is labeled to be a GE specification for heal insulation material, indicates that (1) asbestos insulation should be used with turbines, (2) the turbine vendor (presumably GE) sometimes provides insulation with the turbine, and (3) the insulation for a turbine is sometimes supplied by entities other than the turbine vendor.

  (Pl. Ex. B, Doc. No. 294)

With respect to the so-called "bare metal defense," Plaintiff contends that, where a Defendant supplied a product with original asbestos-containing components parts (or accompanying external insulation), the burden is on Defendant to establish that all of this original asbestos was removed prior to Plaintiff's exposure to the product. According to Plaintiff, in the absence of such proof by Defendant, there is a fact

question as to whether any of the original asbestos was still present at the time of his alleged exposure.

Government Contractor Defense

Plaintiff argues that summary judgment in favor of Defendant on grounds of the government contractor defense is not warranted because there are genuine issues of material fact regarding its availability to Defendant. Plaintiff cites to various military specifications, including, *inter alia*, MIL-M-15071, which, he argues, show that the Navy did not prohibit Defendant from providing warnings with its products and, instead, left the nature and provision of any such warnings for determination by Defendants.

C. Analysis

Plaintiff alleges that he was exposed to asbestos from repair work done on GE turbines. There is evidence that Plaintiff was exposed to respirable dust from external insulation used in connection with GE turbines. There is evidence that GE specifications indicated asbestos insulation should be used with turbines. Importantly, however, there is no evidence that GE manufactured or supplied the insulation to which Plaintiff was exposed. The Court has reviewed the sole document (Exhibit B, Doc. No. 294) on which Plaintiff relies for his contention that GE required and perhaps "arranged" for asbestos insulation on the equipment. Although this document (a GE specification for heat insulation material) indicates that asbestos insulation should be used with turbines, at best it indicates only that it is possible that GE provided the insulation at issue and to which Plaintiff was exposed. In fact, the same document indicates

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that the insulation for a turbine is sometimes supplied by entities other than the turbine vendor. Therefore, even assuming, as Plaintiff implies, that "arranging" for asbestos insulation is the same as "supplying" it (an issue this Court need not reach), Plaintiff's evidence fails to establish that GE arranged for asbestos insulation on the equipment at issue. As such, no reasonable jury could conclude from the evidence that Plaintiff was exposed to asbestos from a product manufactured or supplied by Defendant such that it was a substantial factor in the development of his illness, because any such finding would be based on conjecture. *See Lindstrom*, 424 F.3d at 492. Accordingly, summary judgment in favor of Defendant is warranted. *Anderson*, 477 U.S. at 248–50.

In light of this determination, the Court need not reach Defendant's argument regarding the government contractor defense.

D. Conclusion

Summary judgment in favor of Defendant is granted with respect to all of Plaintiff's claims against it because Plaintiff has failed to identify sufficient evidence of product identification/causation.

E.D. Pa. No.
5:13-00474-ER

AND IT IS SO ORDERED.

/s/ Eduardo C. Robreno, J.
Eduardo C. Robreno J.

* * *

MIL-M-15071D(SHIPS)

3.3 Text. -

3.3.1 Wording. - The text shall be factual, specific, concise, and clearly worded to be readily understandable by personnel involved in the operation, repair, overhaul and maintenance of the equipment, and to provide sufficient information for technicians to install, operate, service; and maintain the equipment at peak performance without the services of a manufacturer's representative. Technical phraseology requiring a specialized knowledge shall be avoided except where no other wording will convey the intended meaning, in which case the technical term shall be defined.

3.3.2 Level of writing. - As a general guide, the level of writing should be that for a high school graduate having specialized training as a technician through Navy training courses.

3.3.3 Figures. - Sectional views of assemblies, sub-assemblies and the component parts thereof shall be shown as necessary to supplement the text, photographs, and drawings and aid in the identification of parts. Identification of illustrated parts with listed parts shall be facilitated by the use of index (or piece) numbers and arrows which will identify assemblies, sub-assemblies and component parts thereof.

3.3.4 Indexing and referencing of figures. - Significant features or components of figures shall be identified by brief applicable nomenclature with arrows. Index (or piece) numbers may be used on

figures when an extremely large amount of nomenclature is required.

3.3.5 Deleted figures. - When a change requires deletion of a figure without substitution of another, the following sentence shall be inserted "Figure _____ deleted" in or near the place of deletion.

3.3.6 Notes, cautions and warnings. - Notes, cautions, and warnings should be used to emphasize important and critical instructions. The use should be as sparing as is consistent with real need. When used, notes, cautions and warnings should immediately precede the applicable instructions and shall be selected in accordance with the following definitions:

(a)"NOTE" - An operating procedure, condition, etc., which it is essential to highlight.

(b) "CAUTION" - Operating procedures, practices; etc., when if not strictly observed, will result in damage or destruction of equipment.

(c) "WARNING" - Operating procedures, practices, etc., which will result in personal injury or loss of life if not correctly followed.

* * *

machinist mates.

Were there — were all of those different rankings present in the engine rooms to do work on a typical shift?

A. No.

Q. Okay. There wasn't a time — how — how did you — how did a machinist mate know to go to the engine room?

A. Well, they had watches.

Q. Okay.

A. And they would be assigned to a watch.

Q. Again, I'm going to talk — now, I'm going to turn on — onto talking specifically about Warren. And you indicated that Warren manufactured pumps that were on the TURNER

A. Correct.

Q. Correct?

A. And Exhibit 2 confirms my memory.

Q. Okay. Do you know how many pumps that you believe were manufactured by Warren actually were on the TURNER?

A. Other than Exhibit 2 of my own memory I don't know.

Q. Okay. Do you know where any — do you

have a recollection as you sit here today where the Warren pumps were located on the TURNER?

A. Warren pumps were in the fire rooms and engine rooms.

Q. Any particular location in the fire room that you recall a Warren pump being located?

A. No.

Q. How about in the engine rooms, do you recall a specific area where a Warren pump was —

A. No.

Q. — located? Do you know any of the different pump — strike that. Pumps, there are all different types of pumps. You talked with Mr. Stokes earlier about that, correct?

A. Yes.

Q. Do you know the types of Warren pumps that were located on the TURNER?

A. I don't know the different types of Warren pumps that were on the TURNER. Again, Exhibit 2 has information.

Q. But as you sit here today you don't have —

A. I don't have a recollection.

Q. Okay. Do you know if any of the Warren pumps were horizontal versus vertical?

A. I don't recollect.

Q. Okay. Would you be able to as you sit here today describe the physical size or dimension of any of the Warren pumps?

A. They varied widely.

Q. Okay. Did they vary widely between al different pumps located on the TURNER or are you saying the Warren pumps themselves varied in size?

A. I wouldn't know, but I refer to Exhibit 2.

Q. Okay. And I understand we went through some documents. I'm just trying to get a feel of what you recall as you sit here today without the documents. Okay? Do you recall as you sit here today actually seeing any

nameplates or any markings that designated it as a Warren pump?

A. No, but —

Q. You can go on and explain.

A. But, again, there were nameplates on some pumps. I just don't remember whose nameplate was on what.

Q. Okay. You talked specifically with Mr. Stokes about some work that was performed in these engine spaces on the TURNER that you witnessed. And one was removing stuffing from the stuffing box on pumps.

A. Or repacking.

Q. Okay. I was going to try to get that word to see if that's what you referred to. As you sit here today, do you recall being in an area when a Warren pump would have been prepacked?

A. I was present for a number of repacking of everybody's pumps. The pumps were a problem on this ship which was in poor repair initially, and as I

indicated to Mr. Stokes, didn't have the right tools to pull the packing so — and also, we didn't have many

* * *

Page 211

failure or product liability maybe.

Q. And what product was involved in this case?

A. This was a product called Korad, K O R A D, acrylic film.

Q. Do you know who was suing or who was the plaintiff in that case, not specifically, but maybe if it was a worker or —

A. No. This was an industrial dispute.

Q. Okay. And what was the dispute over? You don't have to tell me pages and pages, but —

A. Product performance or product misuse.

Q. No one was injured because of the product?

A. No.

Q. Okay. Sir, I have one final question or a couple final questions for Warren that I failed to ask you. As you sit here today, sir, do you have any belief that any of the work that was performed to any of the Warren pumps aboard the TURNER exposed you to asbestos?

A. Yes.

Page 212

Q. And what aspect of the work or what work?

A. Well, number one, removal of insulation created a cloud of dust. And I was in that could of dust.

Q. Okay.

A. Number two, the repacking which we've talked about And, number three, the seals on the flanges which we've talked about.

Q. Okay. And as far as your basis for any of the insulation or the packing or the sealing work containing asbestos, what is the basis of your belief that those products contained asbestos?

A. It was well known in the profession, in the industry that asbestos was the only way to insulate high temperatures. Whereas I couldn't say and earlier today I couldn't say I saw it, I know it was asbestos. I know if should have been asbestos.

Q. So your basis is a link to a high temperature connection; correct?

A. Specification of a high temperature asbestos insulation or packing or seal.

Page 213

Q. Okay. And I think we talked to this with Mr. Stokes. As far as any of the insulation, the repacking or the seal work that you associate with Warren pump, would you know the manufacturer of any of the insulation?

A. No.

Q. Would you know any of the manufacturers of the old packing or the new packing.

A. No.

MR. REICH: We're not going to go through the same questions that we went through.

MS. SCHWEIZER: That's it.

MR. REICH: Okay.

MS. SCHWEIZER: That's it. I'm done.

MR. REICH: Only because there are too many people.

MS. SCHWEIZER: You're absolutely right. I'm done. Thank you very much.

MR. REICH: I have some questions.

MS. SCHWEIZER: Okay.

- - -

EXAMINATION

- - -

BY MR. REICH:

Q. You said, Mr. DeVries that you were exposed to asbestos with regard to the Warren pumps when the repacking was done. Can you tell us why or how you believed you were exposed to dust when repacking was done on the many Warren pumps?

MS. SCHWEIZER: Objection, form and also assumes facts not in evidence.

THE WITNESS: When the repacking — when the packing was pulled, I had to show some sailors how to do it and others just to supervise. And that meant that — like being next to you —

BY MR. REICH:

Q. Indicating about a foot away?

A. Yeah. Being next to you, so of course, I was breathing the dust.

Q. And how was removing the old packing creating dust?

Page 215

A. As I told Mr. Stokes, the proper way is a packing removal tool. But since we didn't have it we would use screwdrivers.

Q. And what would happen?

A. And pry and chip and break up the packing.

Q. Okay. And did the —

A. The old packing.

Q. And what would happen when the old packing was broken up?

A. Go up in the air.

Q. Okay. And did you breathe that?

MS. SCHWEIZER: Objection, form.

THE WITNESS: I was going to say, it was a cloud and I was breathing the cloud.

BY MR. REICH:

Q. Okay. And what about the new packing, what if anything, had to be done to the new packing in order to replace the old packing?

MS. SCHWEIZER: Form, asked and answered.

BY MR. REICH:

Page 216

Q. You can answer that.

A. Okay. I — [illegible] many times.

Q. Okay. Ane what if anything, would happen when the piece of new packing was cut?

A. Usually not much.

Q. Okay. And what had to be done to this new packing?

A. Put around the shaft, wrapped around it. It depends on the pump design.

Q. Okay. And did handling that new packing cause any of the packing material to come apart or come off?

MS. SCHWEIZER: Objection, form.

THE WITNESS: Probably some.

BY MR. REICH:

Q. Okay. And you talked also about seals. Are the seals different than the repacking that you told us about on the pumps?

A. Some, yes. But I was [illegible] the seals on the flange, the mounting flanges.

Q. Okay. Tell us about the seals on the mounting flanges or the Warren pumps that you

were responsible for supervising on the TURNER.

MS. SCHWEIZER: Form, mischaracterization.

MR. REICH: I'm sorry?

MS. SCHWEIZER: Go ahead.

MR. REICH: I didn't hear it.

MS. SCHWEIZER: Form and mischaracterization.

MR. REICH: Okay.

MS. SCHWEIZER: He actually indicated that he did not do that on Warren, but go ahead.

BY MR. REICH:

Q. Go ahead.

A. Well, they had to be scraped clean because when you broke the seal, broke the pipe from the pump, the seal would break. And you'd have to scrape it clean, wire brush as I said earlier.

Q. And what would happen when you scraped and wire brushed —

A. You'd get a cloud of dust.

Q. Okay. Now, did the gasket or seal did

that come off in one piece?

A. No. It broke.

MS. SCHWEIZER: Objection, form.

BY MR. REICH:

Q. Okay. And when it broke how much of it might stick to the flange?

A. Sometimes a lot. Sometimes not so much. Always something. It always had to be some sort of scraping or brushing or both.

Q. Okay. And what kind of brushing was done on the flanges on the Warren pumps when they were being repaired or maintained?

MS. SCHWEIZER: Form.

THE WITNESS: I can only say that any time you cleaned a flange you would scrape and brush. And I can't say on which pump and flanges and which didn't. But since we didn't have screwed fittings most all had flanges.

BY MR. REICH:

Q. And the changing of the packing and replacement of the seals and the flanges, how frequently would that have to be done on the

Page 219

various Warren pumps?

MS. SCHWEIZER: Form.

BY MR. REICH:

Q. You can answer that.

A. I don't know.

Q. Okay. Over the three year period that you were on the TURNER and responsible for that equipment, can you estimate for us how frequently or how many times that would have been done on a Warren pump?

MS. SCHWEIZER: Form, asked and answered

THE WITNESS: I can — I can estimate that some pumps had to be done it seemed like every week or two. They were out of alignment, the frame they were on was rusted through or had bent, moved. Others went their normal life.

BY MR. REICH:

Q. And you talked a little bit about insulation that was on the outside of the Warren pumps?

A. Outside of —

MS. SCHWEIZER: Form.

Page 220

THE WITNESS: — any pump that, again, that was hot and needed to be insulated.

BY MR. REICH:

Q. Okay. That's what I was going to ask. What was the purpose of the insulation outside of some of the Warren pumps?

MS. SCHWEIZER: Objection, form and mischaracterization. He said that some of the pumps. He did not say some Warren pumps.

BY MR. REICH:

Q. Was there insulation on some, outside on some of the Warren pumps?

MS. SCHWEIZER: Objection, asked and answered.

THE WITNESS: I can't recollect with certainty that which pumps had insulation and which did not.

BY MR. REICH:

Q. Okay. And if there were Warren pumps with insulation on the outside, what would have to be done to that insulation when the pump was being serviced?

Page 221

MS. SCHWEIZER: Calls for speculation.

THE WITNES: It would have to be removed and then replaced in some manner.

BY MR. REICH:

Q. And what would happen when that insulation was being handled to remove it?

A. It would get —

MS. SCHWEIZER: Same objection.

THE WITNESS: it would get broken up and one of these clouds that I have mentioned would form.

BY MR. REICH:

Q. And did you breathe that dust?

MS. SCHWEIZER: Form.

THE WITNESS: I was right there.

BY MR. REICH:

Q. Okay. And when the insulation on the same pump had to be replaced, what would happen?

MS. SCHWEIZER: Form.

THE WITNESS: If you replaced

it and had in your spare parts an insulation blanket. If a blanket was used normally, you can replace it. Sometimes also people made up a slurry and that would be a slurry with asbestos or a mud to insulate.

BY MR. REICH:

Q. Okay. What was the purpose of this outside insulation on pumps?

MS. SCHWEIZER: Form, asked and answered.

THE WITNESS: One, one purpose was to keep people from getting burned. They primarily wanted to keep the heat in, not out.

BY MR. REICH:

Q. So those are the two purposes?

A. Yea.

Q. And was that because the pumps were malfunctioning or was this normal functioning of a pump with that near with it?

A. Depending on —

MS. SCHWEIZER: Form.

THE WITNESS: Depending on the application the pump would be designed to be insulated or an example [illegible] used fresh water

* * *

* * *

(c) each and every related company.

ANSWER:

See Preliminary Statement and General Objections, incorporated by reference herein. Warren objects to this Interrogatory as overbroad, unduly burdensome and irrelevant to the extent that it is not limited to the Warren pump(s) or time period relevant to Plaintiffs' claims against Warren. Warren further objects to this Interrogatory to the extent that it seeks information pertaining to any entity other than Warren Pumps, LLC, specifically any alleged "predecessor" or "related company." Moreover, Warren objects to the phrase "related company" as vague, ambiguous, and calling for speculation in addition to requiring a legal conclusion. Finally, Warren objects to this Interrogatory as argumentative in its implication that Warren is a manufacturer of "asbestos-containing products," which Warren denies. Warren's sole manufactured products are pumps.

17. State the first and last dates on which any asbestos-containing product was specified, sold, distributed, applied and/or installed within the United States by:

(a) Defendant;
(b) each and every predecessor, and,
(c) each and every related company.

ANSWER:

See Preliminary Statement and General Objections, incorporated by reference herein. Warren Pumps objects to this Interrogatory on the grounds that the term "specified" is vague, ambiguous, and argumentative.

Subject to and without waiver of the foregoing Preliminary Statement, General Objections, and specific objections, Warren states that it did not specify the use of asbestos-containing products. Rather, Warren Pumps are generally manufactured to the specifications of the customer such as the U.S. Navy. For instance, pursuant to government specifications, it manufactured pumps for U.S. Navy vessels that had to withstand the most severe combat conditions imaginable pursuant to government contracts utilizing materials tested and strictly specified by the United States Navy for utilization aboard U.S. Navy ships. For these pumps to withstand severe combat conditions, in Navy applications, for example, the U.S. Navy required the use of certain component parts such as gaskets or packing, some of which may have contained asbestos. The U.S. Navy required that such asbestos-containing components be purchased from certain manufactures that it had approved in advance. The date as to when Warren Pumps no longer used an asbestos-containing component such as a gasket or packing depended on the particular pump application. Should plaintiff identify a particular time period, pump and location, Warren Pumps will endeavor to determine whether additional information exists, but Warren pumps no longer contain asbestos-containing components.

18. State the last date on which Defendant or any related company specified, sold, distributed, applied and/or installed any asbestos-containing product outside the United States and identify by brand or trade name the products so specified, sold, distributed, applied and/or installed.

ANSWER:

See Preliminary Statement and General Objections, incorporated by reference herein. Warren Pumps objects to this Interrogatory on the grounds that the term "specified" is vague, ambiguous, and argumentative. Warren refers Plaintiff to its response to Interrogatory No. 17.

19. Identify by full and complete trade name, any and all asbestos-containing products as defined above, which this Defendant, any related company, or any predecessor(s) has, at any time:

(a) Designed;
(b) Manufactured;
(c) Processed;
(d) Sold;
(e) Distributed;
(f) Applied;
(g) Installed;
(h) Patented;
(i) Specified; or
(j) Re-labeled.

ANSWER:

See Preliminary Statement and General Objections, incorporated by reference herein. Warren objects to this Interrogatory as overbroad, unduly burdensome and irrelevant to the extent that it is not limited to the Warren pump(s) or time period relevant to Plaintiffs' claims against Warren. Warren further objects to this Interrogatory to the extent that it seeks information pertaining to any entity other than Warren Pumps, LLC, specifically any alleged "predecessor" or "related company." Moreover, Warren objects to the phrase "related company" as vague, ambiguous, and calling

for speculation in addition to requiring a legal conclusion. Finally, Warren objects to this Interrogatory as argumentative in its implication that Warren is a manufacturer of "asbestos-containing products," which Warren denies. Warren's sole manufactured products are pumps.

Subject to and without waiver of the foregoing Preliminary Statement, General Objections, and specific objections, Warren states that it is a manufacturer of pumps only, which are made from metal alloys such as stainless steel, steel, cast iron, titanium, and bronze. Warren never manufactured "asbestos-containing products" such as gaskets, packing, or insulation. Moreover, Warren did not manufacture other equipment such as turbines, valves or piping, nor did Warren manufacture or supply flange gaskets. Warren never mined, milled, or purchased raw asbestos and was not part of the textile industry. Notwithstanding, Warren Pumps manufactured pumps that would pump various liquids at varying temperatures and viscosities. The types of pumps are almost too numerous to describe, however. The pumps could be broken down into three categories by how the pumping action was achieved: (1) Centrifugal, (2) Reciprocating, (3) Rotary or Screw.

(1) Centrifugal Pumps – Centrifugal pumps use an impeller within the pump to draw the liquid through the pump. There could be one or more than one impeller within the pump. For these pumps to withstand severe combat conditions, in Navy applications, for example, the U.S. Navy required the use of certain component parts such as gaskets or packing, some of which may have contained asbestos. The U.S. Navy required that such asbestos-containing

components be purchased from certain manufacturers that it had approved in advance. Those gaskets could have been manufactured by Garlock, Durabla or a number of other manufacturers that were listed in the QPL's by the U.S. Navy. To the extent that packing was used in these pumps, it could have been manufactured by John Crane or a number of other manufacturers that were listed in the QPL's by the U.S. Navy.

(2) Reciprocating Pumps – Reciprocating pumps use pistons to pump fluid. Most often these were auxiliary or emergency pumps manufactured for the bilges or to provide emergency feedwater to the boilers aboard U.S. Navy ships. For these pumps to withstand severe combat conditions, in Navy applications, the U.S. Navy required the use of certain component parts, some of which may have contained asbestos. The U.S. Navy required that such asbestos-containing components be purchased from certain manufacturers that it had approved in advance. For example, for pumps to withstand severe combat conditions, the U.S. Navy may have required that some of the packing and gaskets contained asbestos. In addition, the United States Navy specified the use of internal insulation, completely enclosed in a steel covering, which may have contained asbestos. However, Warren Pumps did not make such insulation, but had to buy it from a company approved by the U.S. Navy.

(3) Rotary or Screw Pumps – Rotary or Screw pumps simply use interlocking gears or a screw to push liquid through the pump. These pumps were generally used for more viscous materials. For these pumps to withstand severe combat conditions, in navy

applications, for example, the U.S. Navy required the use of certain component parts such as gaskets or packing, some of which may have contained asbestos. The U.S. Navy required that such asbestos-containing components be purchased from certain manufacturers that it had approved in advance. Those gaskets could have been manufactured by Garlock, Durabla, or a number of other manufacturers that were listed in the QPL's by the U.S. Navy. To the extent that packing was used in these pumps, it could have been manufactured by John Crane or a number of other manufacturers that were listed in the QPL's by the U.S. Navy.

Should plaintiff identify a particular time period, pump and location, Warren Pumps will endeavor to determine whether additional information exists.

20. With respect to each asbestos-containing product listed for each subpart of Interrogatory No. 19:

(a) Identify the specific company (Defendant, predecessor, related company) which designed, manufactured, processed, specified, sold, distributed, applied, installed, patented or re-labeled such product;

* * *

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

[illegible] to whom these presents shall come.. Greeting:

By virtue of the authority vested in me by the Archivist of the United States, I certify on his behalf, the seal of the National Archives of the United States, that the attached reproduction(s) is a true and correct copy of documents in his custody.

SIGNATURE	
/s/ Timothy K. Nenninger	
NAME	DATE
Timothy K. Nenninger	10/14/52
TITLE	
Chief, Modern Military Records LICON	
NAME AND ADDRESS OF DEPOSITORY	
National Archives and Records Administration 8601 Adelphi Road College Park, MD 20740	

NA FORM 14007 (10–86)

MILITARY SPECIFICATION

INSULATION FELT, THERMAL, GLASS FIBER (FOR TEMPERATURES UP TO 1,200°F.)

This specification was approved by the Departments of the Army, the Navy, and the Air Force for use of procurement services of the respective Departments.

1. SCOPE

1.1 This specification covers glass fiber insulation felt for thermal control of machinery and equipment such as steam turbines, boilers, boiler feed pumps, etc., at temperature up to 1,200°F.

2. APPLICABLE SPECIFICATIONS, STANDARDS, DRAWINGS, AND PUBLICATIONS

2.1 The following specifications and standards, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL

SS–C–466 —Cloth, Yarn, Thread, and Tape; Asbestos.

MILITARY

JAN–P–105 —Packaging and Packing for Overseas Shipment—Boxes, Wood, Cleated, Plywood.

JAN–P–106 —Packaging and Packing for Overseas Shipment—Boxes, Wood, Nailed.

MIL–B–107 —Boxes, Wood, Wire-bound (Overseas Type).

JAN–P–125 —Packaging and Packing for Overseas Shipment — Barrier-Materials, Waterproof, Flexible.

MIL–A–140 —Adhesive, Water–Resistant, Waterproof, Barrier–Material.

MIL–I–942 —Insulation Batt, Thermal, Fibrous Glass.

NAVY DEPARTMENT

General Specifications for Inspection of Material.

STANDARDS

MILITARY

MIL–STD–105— Sampling Procedures and Tables for Inspection by Attributes.

MIL–STD–129— Marking of Shipments.

(Copies of specifications, standards, and drawings required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Qualification. —Glass fiber insulation furnished under this specification shall be a product which has been tested and has passed the qualification tests specified in section 4 (see 6.2).

3.2 Material and construction. —The material shall consist of staple glass fibers felted into rovings and woven or bound with wire inserted asbestos thread (type III of Spec. SS–C–466) to form a flexible blanket. The construction shall conform to that of the sample submitted for qualification.

3.3 Dimensions.

3.3.1 *Length.*—Unless otherwise specified in the contract or order, the insulation shall be furnished in rolls 50 feet in length.

3.3.2 *Width.*—Unless otherwise specified in the contract or order, width of roll shall be 60 inches. A tolerance in width of plus one–half inch and minus one–fourth inch will be permitted.

3.4 Thicknesses and weights.—The insulation shall be furnished in the thicknesses shown in table I, as specified (see 6.1), and shall vary not more than plus or minus 10 percent from the weight specified for the ordered thickness.

TABLE I.—*Thicknesses and weights*

Thickness	Thickness tolerance ±	Weight per square foot
Inches	Inch	Ounces
¾	⅛	9.0
1	⅛	12.0
1½	⅛	18.0

3.5 Fineness of fiber.—The diameter of the individual fibers shall average between 0.00030 and 0.00040. The maximum diameter of any fiber shall be not more than 0.00050 (see 4.6.3).

3.6 Resistance to vibration. —There shall be no sagging or settling of the insulation when subjected to the vibration test for a period of 100 hours (see 4.6.4).

3.7 Alkalinity.—The alkalinity of the finished material expressed as sodium oxide (Na_2O) shall not exceed 0.20 percent (see 4.6.5).

3.8 Fusing temperature.—The fusing temperature of the fibers shall be not less than 1300°F. (see 4.6.6).

3.9 Stability.—The insulation shall reveal no physical changes upon completion of the stability tests specified in 4.6.7.

3.10 Thermal conductivity.—Thermal conductivity (k) in B.t.u. per hour per square foot of insulation for 1°F. gradient per inch thickness shall not exceed the values at the mean temperatures shown in table II (see 4.6.8).

TABLE II.—*Thermal conductivity*

Mean temperature	Thermal conductivity (k)
Degrees F.	
100	0.32
300	.45
500	.56
700	.70

3.11 Workmanship. — The workmanship shall be first class in every respect.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 Inspection procedures.—For Naval purchases, the general inspection procedures shall be in accordance with General Specifications for Inspection of Material.

4.2 Qualification tests at a Government laboratory. — Qualification tests shall be conducted at a Government laboratory designated by the Bureau of Ships. These tests shall consist of the tests specified in 4.6.

4.3 Sampling.

4.3.1 *Lot.*—For purposes of sampling a lot shall consist of not more than 25,000 square feet of glass fiber insulation felt of the same thickness offered for delivery at one time.

4.3.2 *Sampling for lot acceptance inspection and tests at the place of manufacture.*

4.3.2.1 *Sampling for lot acceptance inspection.*—A random sample of rolls shall be selected from each lot of material by the Government inspector with lot acceptance based on table III in accordance with Standard MIL–STD–105.

TABLE III.—*Sampling for inspection*

Number of rolls in inspection lot	Number of rolls in sample	Acceptance number (defectives)	Rejection number (defectives)
15 and under	5	0	1
16 to 40	7	0	1
41 to 65	10	0	1
66 to 110	15	1	2
Over 110	25	2	3

4.3.2.2 *Sampling for lot acceptance tests.*— From each lot the Government inspector shall select seven samples 12 by 60 inches at random for the tests specified in 4.5.1.

4.3.3 *Sampling for production check tests at a Government laboratory.*—From the first lot offered for delivery under a contract or order, and thereafter from one lot in each group of 15 successive lots of the same thickness, the Government inspector shall select two samples 36 by 36 inches at random. These samples shall be forwarded by the Government inspector to a Government laboratory designated by the bureau or agency concerned for testing in accordance with 4.5.2.

4.4 Inspection.—Each of the sample rolls selected in accordance with 4.3.2.1 shall be surface inspected, weighed, and measured to determine conformance with the requirements of this specification which do not require tests. Any roll in the sample containing one or more visual or dimensional defects shall be rejected, and if the number of defective rolls in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected. Rejected lots may be offered again for Government inspection provided the contractor has removed all nonconforming rolls. The Government

inspector shall again select and examine samples from such rejected lots to verify compliance with this specification.

4.5 Tests.

4.5.1 *Lot acceptance tests at place of manufacture.* — The samples selected in accordance with 4.3.2.2 shall be subjected to the tests specified in 4.6.1, 4.6.2, 4.6.3 and 4.6.6.

4.5.1.1 *Action in case of failure.*—If any one of the samples tested is found to be not in conformance with this specification, the lot which it represents shall be rejected. A rejected lot may be resubmitted for Government inspection only after the manufacturer, after being informed of the reasons for rejectance has so reworked the entire lot as to remove or correct all nonconforming material.

4.5.2 *Production check tests at a Government laboratory.*—The samples selected in accordance with 4.3.3 shall be forwarded to the Naval Engineering Experiment Station, Annapolis, Md. to be tested as specified in 4.6.3, 4.6.5 and 4.6.6. Tests of performance as specified in 4.6.4, 4.6.7 and 4.6.8 shall also be conducted as deemed necessary by the Laboratory.

4.5.2.1 *Action in case of failure.*—Acceptance of the first lot offered for delivery under a contract or order shall be withheld until a satisfactory report is received on the production check test sample. Thenceforth, except as hereinafter specified, acceptance and rejection of lots shall normally be on the basis of the sampling and inspection specified in 4.3.2.1 and 4.4, and acceptance shall not be withheld pending receipt of test reports on production check test samples. However, upon receipt of an unsatisfactory test report

on a production check test sample, the Government inspector shall select additional samples from every subsequent lot offered for delivery. The samples so selected shall be submitted to United States Naval Engineering Experiment Station, Annapolis, Md., and shall there be subjected to test or tests wherein failure was observed. Lots shall then be accepted only upon receipt of a satisfactory test report on the samples so selected.

Additional testing shall be discontinued and lot acceptance returned to the normal basis when three successive lots have been accepted.

4.6 Test procedures.

4.6.1 ***Thickness.***—The test specimen shall be ruled off into 10 approximately square and equal areas, and the thickness measurement taken at the center of each area. In determining the thicknesses, the test specimen shall be placed on a hard flat surface, and the penetrating pin of the depth gage shall be forced downward through the specimen, perpendicular to the flat surface as shown on figure 1. If necessary to prevent compression of the specimen by the depth-gage pin, the specimen shall first be pierced. When the point of the pin touches the flat surface, the sliding disk shall be lowered to the point of contact with the top surface of the specimen. The gage shall be withdrawn, and the distance from the point of the pin to the sliding disk shall be measured to the nearest 1/32-inch. The average of the 10 thickness measurements shall be taken as the thickness of the test specimen.

4.6.2 ***Weight.***—Each sample roll selected in accordance with 4.3.2.1 shall be weighed on suitable scale to verify compliance with 3.4.

4.6.3 ***Fineness of fibers.*** — Diameter of fibers shall be determined microscopically on the basis of at least 7 checks on each of the samples. The average diameter for purposes of determining conformance with 3.5 shall be the average of all measurements on all samples; the maximum shall be the maximum diameter of any fiber thus measured.

4.6.4 ***Resistance to vibration.***—The test for determining ability of the material to withstand vibration while subjected to a temperature of 1,200°F. shall be conducted on two 2–foot square, 2–inch thick sheets which shall be mounted on the faces of an electrical heater plate. The ends of the heater plate shall be insulated with cut sections of the material and the entire assembly shall be fitted and mounted within a 1/16–inch thick sheet–iron casing 30 by 30 by 6 inches. The casing shall be mounted in a vertical position on a vibration test apparatus. Five iron constantan thermocouples, equally spaced and secured in each face of the heater plate and the outer surfaces of the metal casing, shall afford a means of ascertaining the inner and the exposed temperature of the assembly. During the test the material shall be subjected to 720 vibrations per minute through an arc of 15 minutes for a period of 100 hours of operation. At the end of the 100–hour period of operation the outer metal casing of the assembly shall be removed and the condition of the sheets noted.

4.6.5 ***Alkalinity.***—Weigh a 5 ± 0.01 gram (gm.) representative sample of the felt, and introduce into a

500 milliliter (ml.) pyrex Erlenmeyer flask. Wet with 5 ml. of 95 percent ethyl alcohol, and add 400 ml. of distilled water. Reflux for 4 hours ±5 minutes. At the end of this period, disconnect the condenser and filter at once through No. 41 Whatman paper supported in a Buechner funnel. Wash the flask and material three times with 25 ml. portions of hot distilled water using suction. Titrate immediately with 0.02 NH_2SO_4, using 6 to 8 drops of 1 percent solution of phenol–red indicator, to the disappearance of the pink color. Run a blank determination on the same amount of distilled water and alcohol and correct for any alkalinity shown. The percentage alkalinity as Na_2O is calculated from the following formula: percent Na_2O = 0.0124 (ml. H_2SO_4 used by sample minus ml. H_2SO_4 used by blank).

4.6.6 *Fusing temperature.* —Weigh 1 gm. of glass fiber into a crucible and place in a muffle furnace at room temperature. Turn all heating elements on at start of test and adjust so that the specified temperature of 1,300°F. is reached in 45 minutes. When this temperature is reached, remove crucible from furnace immediately, allow to cool, and examine visually for fusion. Fusion shall be said to have taken place if any part of the sample has melted and formed a homogenous mass.

4.6.7 *Stability.* —Samples of felt 4 inches square shall be encased in a metal wire screen and placed on a rack above the water level in a steam digester. The samples shall be subjected to saturated steam at 225 pounds per square inch (p.s.i.) gage for 1.6 hours. Samples shall then be removed, examined, and conditions noted.

4.6.8 *Thermal conductivity.*—Thermal conductivity shall be determined by the guarded hot plate method specified in Specification MIL–I–942.

5. PREPARATION FOR DELIVERY

5.1 Packing.

5.1.1 *For domestic shipment.*—The subject commodity shall be furnished in bales covered with standard 7½ ounce (weight) burlap tubing with tubing drawn together at each end with wire. The gross weight shall not exceed 200 pounds.

5.1.2 *For oversea shipment.*—The subject commodity shall be packed in cleated–ply-wood, nailed wood, or wirebound boxes conforming to Specification JAN–P–105, JAN–P–106, or MIL–B–107, respectively. Shipping containers shall be lined with a sealed waterproof bag or its equivalent, made from material conforming to Specification JAN–P–125, for case liners. The seams and closures shall be sealed with adhesive conforming to Specification MIL–A–140. The gross weight shall not exceed approximately 200 pounds.

5.1.3 *For domestic or oversea shipment.*— Where practicable, shipping containers shall be of uniform size, and shall contain the identical number of rolls. Containers shall be designed to fit the contents in a compact manner.

5.2 Marking. In addition to any special marking required by the contract or order shipping containers shall be marked in accordance with Standard MIL–STD–129.

6. NOTES

6.1 Ordering data. — Procurement documents should specify the following:

(a) Title, number, and date of this specification.

(b) Thickness of insulation required (see 3.4).

(c) Whether packing for domestic or oversea shipment is required (see 5.1).

6.2 In the Procurement of products requiring qualification the right is reserved to reject bids on products that have not been subjected to the required tests and found satisfactory for inclusion on the Military Qualified Products List. The attention of suppliers is called to this requirement, and manufacturers are urged to communicate with the Bureau of Ships, Navy Department, Washington 25, D.C., and arrange to have the products that they propose to offer to the Army, the Navy or the Air Force, tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products covered by this specification may be obtained from the Chief of the Bureau of Ships, Navy Department, Washington 25, D.C.

Notice. —When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or

otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

Custodian:
Army – Corps of Engineers
Navy – Bureau of Ships
Air Force

Other interest:
Army – OT
Navy – SY.

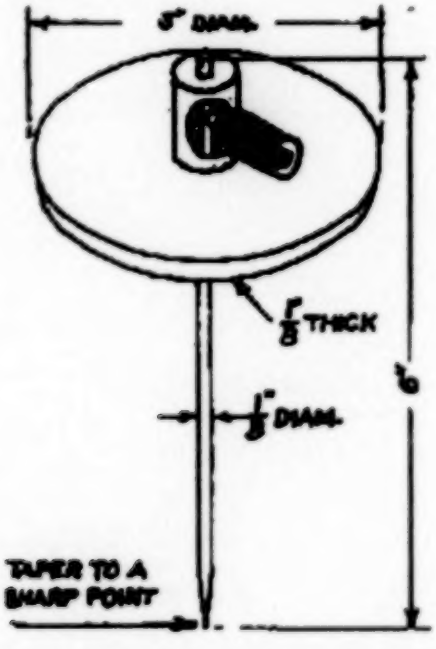

FIGURE 1.—*Depth gage for thickness measurements*

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